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# USSR Report

SCIENCE AND TECHNOLOGY POLICY

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USSR REPORT  
SCIENCE AND TECHNOLOGY POLICY

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## ORGANIZATION, PLANNING AND COORDINATION

### SCIENTIFIC, TECHNICAL PROGRESS IN UKRAINIAN INDUSTRY

Moscow SOTSIALISTICHESKIY TRUD in Russian No 4, Apr 86 pp 18-27

[Article by Academician of the Ukrainian SSR Academy of Sciences N. Chumachenko, director of the Institute of Industrial Economics of the Ukrainian SSR Academy of Sciences: "The Main Direction Is Scientific and Technical Progress"; capitalized passages published in boldface]

[Text] The Decisive Role of Scientific and Technical Progress

Without the cardinal acceleration of scientific and technical progress it is impossible to achieve decisive changes in the growth rate of labor productivity and the improvement of product quality. This assumption does not need now special proof. The development of fundamentally new equipment and technology and the improvement of operating ones, the use of new types of materials, and the mechanization and automation of production are also called upon to perform a most important social function: to change radically the content and conditions of labor.

In this respect the example of the coal industry of the republic is characteristic. The replacement of face equipment with machinery of a new generation in combination with the improvement of the organization of labor is ensuring the increase of its productivity, the increase of the volumes of coal production, and the relative freeing of workers. At one of the southern longwalls of the Ukraina Mine of the Selidovo Coal Production Association, for example, an advanced KM-88 high performance complex was installed, as a result of which the load on the longwall increased to 1,000 tons a day and the indicators of production efficiency increased. With the complete assimilation of the complex the average monthly output of a worker in mining increased by 14.6 percent.

Further. In recent years fundamentally new technologies have been acquiring greater and greater importance. Whereas previously the introduction of scientific and technical achievements envisaged primarily the change of the means of labor, while technology played a secondary role, now the ratio is changing and, perhaps, in favor of technology. And not by chance, since the analysis showed that the expenditures on the introduction of new technologies are recovered, as a rule, more rapidly. Thus, the additional profit per ruble of expenditures, which was derived on this basis, is 1.5-fold greater than in

other directions of technical progress. Moreover, the impact, which was achieved in case of the introduction of new technologies, per ruble of expenditures is increasing, while in other directions the tendency for it to decrease is being observed.

At the same time it is impossible to shut one's eyes to the fact that scientific and technical progress at times also gives rise to negative phenomena. Thus, given a narrow departmental or narrow technocratic approach the introduction of new equipment causes the pollution of the environment, the impoverishment of the functional content of labor, the increase of its monotony, and so on. The attempts that are subsequently made to eliminate these negative consequences of scientific and technical progress can require such expenditures which do not make up for the obtained impact. Therefore, the measures of scientific and technical progress require the careful analysis of the consequences of their implementation already at the stage of the planning of the development of enterprises. When designing technological processes, machines, and mechanisms it is necessary to take into account how they will affect the environment and working conditions. Thus, under socialism only such directions of scientific and technical progress and such tools of labor and technologies, which, by making it possible to save manpower and material resources, contribute to the improvement of the environment and to the improvement of working conditions, should receive recognition. In other words, A SYSTEMS APPROACH TO THE ACCELERATION OF SCIENTIFIC AND TECHNICAL PROGRESS, WHICH UNITES THE INTERESTS OF THE SEPARATE INDIVIDUAL, ENTERPRISES, THE SECTOR, AND SOCIETY AS A WHOLE, SHOULD BE ENSURED. Here it is appropriate to repeat the words of V.I. Lenin, which were quoted in the report of M.S. Gorbachev at the October (1985) CPSU Central Committee Plenum, concerning the need for attention to social questions: "This will be the best policy, this will be the most economical management. Otherwise we, having saved several hundred millions, might lose so much that no billions will restore what has been lost."

At the 27th party congress it was noted that the influence of scientific and technical progress on the increase of labor productivity does not yet satisfy the requirements of the changeover of the economy to the primarily intensive means of development. Here is a characteristic example for our republic. During the past five-year plan under the influence of the increase of labor productivity in the Ukrainian SSR national economy a little more than 25percent was conditionally freed. During 1984-1985 the introduction of the achievements of science and technology provided an increase of productivity in industry by 2.2 percent, which is obviously inadequate. But this year it is also envisaged to keep this indicator at approximately the same level.

In recent times a large number of highly efficient technologies have been developed in our country. However, it has to be admitted that the fundamentally new technologies, which have been developed by Soviet scientists and have passed the test of time, are being introduced extremely slowly. Thus, a new metallurgical process--electroslag remelting (EShP), which was proposed by the Institute of Electric Welding imeni Ye.O. Paton of the Ukrainian SSR Academy of Sciences and in case of which each ton of metal is equivalent to 2 tons of alloyed steel--takes up a small share in the total volume of production of metal in the country. The new technology of producing

high-strength pig iron on the basis of the use of complex inoculants is being introduced slowly, although the castings, which are being obtained at a number of enterprises from it, attest to the substantial advantages of this technology. In the Ukraine alone on this basis it is possible to increase the volume of foundry work without the expansion of fixed capital by more than 5percent.

Here is another example. The installation in the flow of steel-making units of continuous blank casting machines makes it possible not only to increase by 8-12 percent the output of acceptable rolled products, but also to free workers who are employed in the operations of the pouring of steel and the preparation of assemblies with ingot molds. The opportunity appears to eliminate roughers from the flow. But for the present these machines have also not yet found extensive dissemination in industry.

The introduction of energy- and resource-saving technologies yields the greatest results, when the entire technological chain, including the auxiliary links, is provided with new equipment. A goal program nature should be lent to this process. This does not mean that it is necessary to devise special goal programs of the development and introduction of new technologies, but it is necessary to base oneself on them when formulating goal programs of the retooling of production. It is necessary, in our opinion, to concentrate capital investments precisely here.

The development and use of fundamentally new technologies and types of equipment should become an integral function of economic management. In this connection it seems advisable to strengthen the coordination of the work of the USSR State Planning Committee on the improvement of planning with the activity of ministries, scientific research organizations, associations, and enterprises. Obviously, THE NEED HAS ARISEN TO DEVELOP A SYSTEM OF THE STATE REGISTRATION AND RECORD KEEPING OF NEWLY INTRODUCED TECHNOLOGIES AND EQUIPMENT IN ORDER TO SPEED UP THEIR DISSEMINATION IN RELATED INDUSTRIES.

#### The Reserves of the Mechanization and Automation of Production

One of the main directions of scientific and technical progress is the increase of the level of the mechanization and automation of production, particularly the introduction of mechanized and automatic lines. The most significant results in case of the conversion of workers from manual to mechanized labor can be obtained on this basis. However, the large reserves, which exist in industry, of the increase of the efficiency of the operation of mechanized and automated lines for the present are being used inadequately. Many of them are being operated with an incomplete load in case of a low shift coefficient.

The Institute of Industrial Economics of the Ukrainian SSR Academy of Sciences analyzed how this problem is being solved in four oblasts of the republic, which are noted for a multisectorial structure of industry. The analysis showed that in industry of Voroshilovgrad Oblast, for example, more than 40percent of the total number of mechanized and automatic lines have not achieved the full rated capacity. At enterprises of the food industry here nearly a fifth of the mechanized and automatic lines have been assimilated by



less than 50 percent. Approximately the same situation also exists in Zaporozhye Oblast, where 5 percent of the installed automatic lines are not in operation. The average daily shift coefficient of mechanized and automated lines during the years of the past five-year plan varied negligibly in this oblast: for mechanized lines this indicator remained at the level of 2.1 percent, while for automatic lines it increased from 2 to 2.2 percent, nearly 20 percent of the mechanized lines operate during one shift.

It should be noted that the increase of labor productivity directly depends on how quickly the facilities, which are being built on a new, higher organizational and technical basis, are assimilated. Good examples exist here. Thus, at the Donetsk Cotton Combine during the past five-year plan the new highly productive equipment: the majority of spinning and finishing machines, began to be used better. The average sectorial level of productivity was exceeded for the new pneumatic rapier machines. At the combine the use of equipment in time is being improved systematically--the downtimes of looms decreased from 6.6 percent in 1980 to 4.3 percent in 1984. The retooling of production, which is being accompanied by the improvement of its organization, has made it possible to eliminate completely down times due to undermanning. The losses of time, which are due to the lack of raw materials, materials, and electric power and unscheduled repairs of equipment, have been sharply reduced.

However, as the survey of 116 industrial facilities, which were put into operation (or were renovated) during the years of the 10th and 11th Five-Year Plans, showed, during 1983-1984 only 54 facilities (about 47 percent) operated in conformity with the capacity and labor productivity, which were specified in the design. At the majority of them the schedules of the assimilation of capacities are being violated and the design indicators are not being observed.

This is often connected with the fact that the construction workers present for delivery start-up projects and complexes with a large number of flaws, which are not ready for normal operation. Their operation leads to enormous losses, which are connected with various kinds of alterations under the conditions of operating production, and to lengthy periods of assimilation, which exceed by two- to threefold the standard periods.

The level of labor productivity is also decreasing due to the fact that at many facilities, which are being newly placed into operation, the design standards of personnel are not being maintained. Thus, in all nearly twofold more workers than envisaged by the design were employed in 1985 at the coal mines of Voroshilovgrad Oblast (the Mine imeni 60-letiya SSSR, the Mine imeni Frunze, the Mine imeni Vakhrushev, and the Komsomolskaya Mine). The design number was exceeded at the converter works of the Zhdanov Azovstal Metallurgical Combine imeni Ordzhonikidze and at the complex for the production of railroad cars for the transportation of mineral fertilizers of the Stakhanov Railroad Car Building Plant.

Moreover, not only the actual, but also the planned indicators of the number significantly exceed the design indicators. The analysis of the work of the facilities being assimilated in Zaporozhye Oblast showed that at nearly

30percent of them the planned number of personnel exceeds by 1,300 the design number. To a significant extent this is connected with the fact that at many enterprises a set of measures, which are aimed at the achievement of the design indicators, has not been elaborated, facilities are being placed into operation with construction and installation flaws, the number of workers was established with inadequate substantiation.

Frequently design organizations understate the indicators of the number. At the same time, when the design documents for new facilities are being coordinated, the basic attention is devoted to the volume indicators. In state reporting the majority of enterprises do not indicate for what reasons the lag behind the rated level of labor productivity occurs, although this is stipulated by state reporting in accordance with form 1-TP (annual). Of course, it is impossible to tolerate this situation further, this would be at variance with the directives of the 27th party congress. In order to increase the influence of start-up projects and complexes on the increase of labor productivity, at enterprises and associations it is necessary to elaborate and implement measures on the achievement of the indicators of labor productivity and the number of workers, which are envisaged by the design. If they cannot be achieved due to errors in the designs, it is necessary, in our opinion, that the enterprises would demand of the design organizations that they make the appropriate corrections in the designs. Henceforth IT IS ADVISABLE TO ESTABLISH THE IDENTICAL RESPONSIBILITY OF THE DESIGNERS--FOR THE CORRECTNESS OF THE CALCULATION OF THE INDICATORS ON THE VOLUME OF THE OUTPUT OF PRODUCTS, LABOR PRODUCTIVITY, AND THE NUMBER OF WORKERS, AND OF MINISTRIES, ASSOCIATIONS, AND ENTERPRISES--FOR THEIR ACHIEVEMENT. When summarizing socialist competition the indicators of the rated labor productivity and the assimilation of the rated capacities should be equally taken into account. All this will make it possible to increase the prestige of the rated indicators of labor productivity and the number of workers. Along with this it is advisable, in our opinion, to commission one of the scientific research institutes to develop a system of the stimulation of the collectives of design organizations, which would ensure the direct dependence of their material incentive on the results of the assimilation of the rated indicators of start-up projects and complexes.

#### More Attention to Renovation and Retooling

A leading role in the rationalization and reduction of obsolete workplaces on the basis of their certification and rationalization, which are an effective tool of the retooling of production, belongs to scientific and technical progress. The practical implementation of the set of measures, which are envisaged by the decree of the CPSU Central Committee "On the Experience of the Work of the Collective of the Dnepropetrovsk Combine Plant imeni K.Ye. Voroshilov on the Increase of the Efficiency of the Use of Production Capacities on the Basis of the Carrying Out of the Certification of Workplaces and Their Rationalization," is of great importance. Thus, at the Makeyevka Pipe Casting Plant imeni V.V. Kuybyshev as a result of certification 420 of the 519 certified workplaces were improved. The precise registration of the number and state of workplaces was carried out at the Voroshilovgradteplovoz Association. It is envisaged to eliminate as obsolete 558 workplaces and to rationalize about 2,500. The number of operators of several machines



increased here from 250 to 556, in basic production their share came to 30 percent in the total number of machine tool operators. At the Donetsk Metallurgical Plant up to 60 percent of the total number of freed people are being freed as a result of measures on the technical development of production. At the same time at many enterprises the time of the carrying out of the certification of workplaces has been dragged out unjustifiably, moreover, it is characteristic that at them the proportion of workers, who are freed due to technical measures, is small: frequently it comes to 25-30 percent and less, which decreases substantially the effectiveness of certification. With allowance made for the experience of the leading enterprises it seems to us that in case of planning it is very important TO ENVISAGE NOT LESS THAN 60-70 PERCENT OF THE TOTAL FREEING OF THE NUMBER OF WORKERS DUE TO SCIENTIFIC AND TECHNICAL PROGRESS.

It is necessary to recall that one must not regard the completion of the certification of workplaces as a one-time act. It is envisaged by the decree of the USSR Council of Ministers and the All-Union Central Council of Trade Unions "On the Extensive Conducting of the Certification of Workplaces and Their Rationalization in Industry and Other Sectors of the National Economy" to conduct it not less often than twice during the five-year plan. With time it seems advisable to establish a procedure of annual certification in order to elaborate on this basis measures on the rationalization and decrease of workplaces, the elimination of unnecessary, obsolete equipment, and its replacement with new, more productive equipment. It is very important here that the elaborated measures would become a component of the program "Labor."

The insufficiently great efficiency of the measures on the rationalization and reduction of workplaces is one of the causes of the maintenance at many enterprises of an above-plan number of workers. Thus, as a whole for industry of Donetsk Oblast for 26.5 percent of the enterprises at the moment of the last check there were 7,900 people in excess of the established limits. At the same time 64.4 percent of the enterprises were undermanned by 5,800 people.

Frequently it is possible to observe that enterprises, although they are not completely provided with personnel, introduce additional workplaces, moreover, this is done not only by means of new construction and the expansion of production. A large number of new workplaces are introduced as a result of renovation and retooling, although these forms of reproduction should be accompanied by a decrease of the number of workplaces. For example, for 25 facilities of Zaporozhye Oblast, which were renovated during the 10th and 11th Five-Year Plans, it was envisaged by the designs to increase the number of workers by more than 20 percent, which signifies, in our opinion, the expansion of production, and not its renovation.

At the conference in the CPSU Central Committee on questions of the acceleration of scientific and technical progress the tasks were posed to increase already in the next few years the share of the assets, which are being channeled into renovation, in the total amount of capital investments from one-third to at least one-half. Such a task also follows from the decisions of the 27th party congress. If it is taken into account that the development of Siberia and the Far East and the regions of the North and the

economic development of the zone of the Baykal-Amur Railway Line will be carried out due to new construction and the capital investments in machine building will double, the share of the capital investments, which are being allocated for renovation and retooling in the industrially developed regions, should come, according to our calculations, to 70-80 percent.

In this connection it is necessary to direct attention to two circumstances which attest to the fact that the changes in the area of the reform of our investment policy are still inadequate.

First, the share of capital investments is increasing slowly. The study of the draft of the plan for 1986 shows that their share, which is being allocated for the increase of the technical level of operating enterprises, is being increased negligibly. Moreover, in a number of sectors of the republic it is even being decreased as compared with the preceding year (the Ministry of the Coal Industry, the Ministry of Light Industry, the Main Administration of Internal Waters Pisciculture, the Main Administration of the Petroleum Refining and Petrochemical Industry, the Ministry of Industrial Construction). This trend is traced even with respect to those ministries, which are working under the conditions of the economic experiment and have the right to increase the assets for retooling and renovation. For an example it is possible to cite the former Ukrainian SSR Ministry of the Food Industry, in which the share of such expenditures in 1985 was 4.8 percent less than in 1984, while in the draft of the plan for 1986 for the enterprises of this sector it is 7.6 percent less than in 1985. The share of the expenditures on retooling and renovation is also low in power engineering, in which from year to year it does not exceed 6-9 percent.

Second, it is necessary to pose in earnest the question of the efficient use of the assets which are being allocated for retooling and renovation. According to the data of statistics, the share of state capital investments for these purposes with respect to facilities for production purposes came during the 5-year period on the average to more than 30 percent. If these assets had been allocated in accordance with their special purpose, it would have been possible to expect the writing off for the corresponding amount of obsolete equipment and other types of fixed capital, which are being replaced by new types. But, unfortunately, a different thing is being observed—new fixed capital is being placed into operation, while obsolete fixed capital is practically not being written off. If we examine 1984 alone, the placement of fixed capital into operation in industry as a percentage of its value at the end of the year came to 7 percent, while its writing off as a percentage of the total value of the capital at the beginning of the year did not exceed 1.4 percent. Consequently, a significant portion of the capital is being placed into operation at the expense of allocations for retooling and renovation without the retirement of obsolete capital. If this trend is not overcome, the increase of the share of the assets for retooling and renovation in practice will change nothing.

In our opinion, the inadequate influence of retooling and renovation on production efficiency is explained first of all by the imperfection of the system of the management of these processes at all its levels. Thus, the plans of retooling are often a set of uncoordinated, insufficiently sound

measures. As a rule, it is planned for not more than 5 years, and more often for a year. There is no system of the registration and evaluation of the influence of the indicators of retooling on production efficiency. The questions of the financing and stimulation of this work at operating enterprises have not been studied.

It is necessary to have a clear idea of the fact that retooling requires a long time. It involves the replacement of a large amount of obsolete equipment and the performance of a set of scientific research, planning, and design operations on the decrease of manual labor and the mechanization and automation of production. In this connection IT IS NECESSARY, IN OUR OPINION, FOR EACH ASSOCIATION (ENTERPRISE) TO HAVE A COMPREHENSIVE GOAL PROGRAM OF THE RETOOLING AND RENOVATION OF PRODUCTION, WHICH IS INTENDED FOR THE LONG-TERM FUTURE (15-20 YEARS) WITH A BREAKDOWN BY 5-YEAR PERIODS AND YEARS.

This is especially urgent for the industrially developed regions, which have a mighty industrial potential and highly skilled personnel, such as the Donbass or the Urals. The structure of industry of these regions formed over many decades and is distinguished by a high degree of wear of the productive capital. Thus, for industry of the Donetsk Region as a whole the depreciation ratio is higher than on the average for the republic.

Taking into account the role of the acceleration of scientific and technical progress, the Donetsk and Voroshilovgrad Oblast Committees of the Communist Party of the Ukraine adopted a decree on the formulation of the long-term scientific and technical program "The Retooling and Renovation of Industry of the Donbass," which is designed for the period to 2000. The successful implementation of this program is possible on the condition of its complete interconnection with the plan of economic and social development. For this it is necessary that all the assignments, which it is envisaged to implement during the present five-year plan, would be included as a special section in the state plan. In order to use more completely the achievements of science in economic practice, it is advisable in the structure of this section also to envisage basic and applied development.

#### Some Questions of the Stimulation of Scientific and Technical Progress and the Evaluation of Measures

It is possible to increase the influence of scientific and technical progress on the growth of labor productivity only on the basis of advanced forms of the economic stimulation of this process. First of all this pertains to the introduction of energy- and resource-saving technologies. It is a matter of compensating for the additional costs of production regardless of the stage of their emergence, which are due to the introduction of such processes. The enterprises, which produce high-quality products, should not incur losses from this. IT IS NECESSARY TO CONVERT SCIENTIFIC AND TECHNICAL PROGRESS FROM A COST-INCREASING FACTOR OF THE DEVELOPMENT OF PRODUCTION INTO A COST-REDUCING FACTOR.

An extensive set of measures on the improvement of the economic stimulation of the development of new machines and equipment, which conform in their technical, economic, and operating indicators to high world achievements, is



envisaged by the decree of the CPSU Central Committee and the USSR Council of Ministers "On the Extensive Dissemination of New Methods of Management and the Increase of Their Influence on the Acceleration of Scientific and Technical Progress." In particular, starting in 1986 it is proposed to include the cost of the operations on the assimilation of new equipment, which are paid for by means of the assets of the unified fund for the development of science and technology, in the volume of sold products. For products of the highest quality category it is envisaged to use markups on the wholesale price in the amount of up to 30 percent. At the same time it is also necessary to increase the interest in the use of new equipment. The sound distribution of the economic impact in the national economy among all the participants in the production and use of products, which have been obtained in accordance with new technologies, is of prime importance.

Here, in our opinion, the Procedural Recommendations on the Formation and Establishment of the Economic Impact From the Production and Use of High-Quality Products, Which Have Been Obtained as a Result of the Introduction of New Technologies, which were drawn up by the Institute of Industrial Economics of the Ukrainian SSR Academy of Sciences, can be taken as the basis. Their essence consists in the fact that the economic impact in the national economy, which has been achieved due to the use of new equipment and technology through all the "science--technology--production--consumption of the final product" stages, is distributed among the developers and participants in introduction in conformity with the expenditures of living labor, while the obtained amounts are included in the economic stimulation funds of each. The more advanced the equipment and technology being introduced are, the greater the economic impact in the national economy is and the greater the interest of labor collectives in accelerating their introduction will be.

We came to the conclusion that the inadequate influence of scientific and technical progress on the growth of labor productivity in many respects stems from the dissociation of the planning of efficiency and the basic indicators of the activity of enterprises. The drafting of the plans on new equipment, as well as the preparation of state reporting in accordance with forms 2-NT and 10-NT are assigned to workers of the technical departments and other subdivisions, who owing to their occupational orientation often are insufficiently competent in matters of the calculation of the efficiency. The planning departments and other economic services of enterprises in most cases do not check how the economic results of the introduction of new equipment are determined, while the established assignments on the growth of labor productivity are not supported by estimates. For example, at the Donetskormash Production Association with respect to 43 measures of scientific and technical progress, the introduction of which accounts for 57.5 percent of the total amount of expenditures, a change of such indicators as the decrease of the labor intensiveness, the conditional freeing of personnel, the decrease of the production cost, and others was not planned. Plan assignments, which were exceeded by more than 10 percent without the introduction of any substantial organizational and technical measures, were established for several enterprises, as, for example, the Dnepropetrovsk Fizpribor Plant.

Noting the importance of this problem, Comrade M.S. Gorbachev at the conference on questions of the acceleration of scientific and technical progress said: "It is time, for example, to change the situation, in case of which the plan on new equipment exists as if in itself, without having a decisive influence on the indicators of economic and social development. On the contrary, it should become the load-carrying structure of the entire national economic plan. The quality indicators, which reflect the efficiency of the use of resources, the scale of the updating of products, and the growth of labor productivity on the basis of the achievements of science and technology, should hold the leading place in the plans."

And about another very important question which is connected with the improvement of the methods of planning. Scientific and technical progress, as is known, should ensure the saving of not only living, but also embodied labor, which is directly reflected in the increase of the national income. Therefore, it is necessary already now to shift to calculating productivity on the basis of the national income. In this connection economic science has to elaborate sufficiently sound recommendations with a breakdown by sectors and regions.

The insufficiently high growth rate of labor productivity to a significant degree stems from the fact that the actual effectiveness of scientific and technical measures is much less than the effectiveness envisaged during planning. As a whole during 4 years of the past five-year plan and with respect to each year individually the data on the impact from the use of inventions and the introduction of measures on new equipment in statistical reporting were overstated and do not give an idea of the real efficiency of scientific and technical progress.

The actual derivation of a profit in the amount of 1 ruble per 4 rubles of the estimated saving attests to the very low effectiveness of the implemented measures. This occurs first of all because the estimated indicators of their efficiency, which are carried over from the plan to the reporting in the same amount without adjustment for the actual results which were obtained in production, are overstated. At enterprises there is no monitoring of the conformity of the actually achieved impact to the planned impact. At the Institute of Industrial Economics of the Ukrainian SSR Academy of Sciences the effectiveness of 235 efficiency proposals at a number of enterprises of ferrous metallurgy was analyzed. For 120 of them the actual impact proved to be one-half as great as is shown in the reporting, while 115 proposals led to losses. This is a result of the shortcomings of the method, as well as of the fact that neither departments, nor organs of the USSR Central Statistical Administration, nor the USSR State Committee for Inventions and Discoveries check the statistical reporting of associations and enterprises on the economic impact of scientific and technical progress. THE URGENT NEED HAS ARISEN TO MAKE THE ORGANS OF ECONOMIC MANAGEMENT RESPONSIBLE FOR THE RELIABILITY OF THE DATA ON THE EFFICIENCY OF SCIENTIFIC AND TECHNICAL PROGRESS AND THE USSR CENTRAL STATISTICAL ADMINISTRATION RESPONSIBLE FOR THE MONITORING OF THEIR RELIABILITY. At the same time it should be recommended to the Scientific Council of the USSR Academy of Sciences to coordinate the research which is aimed at properly reflecting the actual economic impact which has been obtained from the introduction of measures of scientific and technical



progress. In this connection the proper evaluation of the results of the work of production collectives on the mechanization and automation of processes and operations is of great importance. The indicator now being used of the change of the number of workers, who are engaged in mechanized labor and the supervision of the operation of automatic machines, does not make it possible to judge validly the actual state of affairs in this area.

The absolute freeing of workers of not only manual, but also mechanized labor occurs in case of the mechanization of workplaces "in depth," the taking out of operation or the replacement of worn-out equipment with new equipment, and the elimination of vacant workplaces. The indicator of the number of people employed in mechanized labor can be reduced, distorting thereby the actual results of mechanization. Thus, at the Donetsk Metallurgical Plant imeni V.I. Lenin in 1984 the number of workers, who are engaged in mechanized labor and the supervision of the operation of automatic machines, was reduced by 130, although as a result of the implementation of the set of measures 83 were transferred from manual to mechanized labor. For the Ukrainian SSR Ministry of Ferrous Metallurgy in 1983 the number of workers of this group increased by 652, while 3,881 were freed due to the mechanization and automation of production.

The prevailing classification of the occupations of workers according to the degree of mechanization of labor, in our opinion, also does not conform to the present level of the technical development of production. Their strict attachment to a specific cycle has the result that often the provision of workplaces with the latest equipment does not influence the estimated indicator of the degree of the mechanization of labor. Thus, the use at metallurgical enterprises of a unit for the guniting of the rear walls of open-hearth furnaces, slag pans, and ladles made it possible to mechanize the labor of refractory workers in these operations. But this did not find reflection in the system of accounting and reporting.

The Institute of Industrial Economics of the Ukrainian SSR Academy of Sciences jointly with the Scientific Research Institute of Economics of the Ukrainian SSR State Planning Committee and the Consolidated Department of Science and New Equipment of the Ukrainian SSR State Planning Committee for the evaluation of the results of the work of enterprises and sectors of industry on the mechanization and automation of production proposed to use an indicator, which is defined as the ratio of the expenditures of the labor of workers in mechanized operations to the total labor expenditures. It should be adjusted by a correction factor, which takes into account the increase of the capacity of the equipment in the shops and other subdivisions, in which the measures have been introduced. At the same time it is necessary to define more precisely the classification of the occupations of workers according to the nature of labor in forms 2-prom. with allowance made for the achieved technical level of production.

At present specific methods, which make it possible to identify and evaluate the reserves of the growth of labor productivity, have already formed. The economic analysis constitutes their basis. In the literature mainly the procedural questions of the analysis of labor productivity at enterprises, in individual associations, and in sectors of industry are presented, the methods

of conducting it are accordingly improved. At the same time the present level of the development of the economy requires that the efficient combination of the sectorial and territorial aspects be ensured. THE MONITORING AND ANALYSIS OF THE FULFILLMENT OF THE PLAN ON LABOR PRODUCTIVITY SHOULD BE CARRIED OUT BOTH AT ENTERPRISES, MINISTRIES, AND DEPARTMENTS AND BY REGIONAL ORGANS. We believe that for the increase of production efficiency the regional aspect is of no less importance than the sectorial aspect. On the basis of the efficient combination of sectorial and territorial management the degree of its efficiency increases, it becomes more specific and purposeful, the opportunity to take the necessary steps directly on the spot appears. Thus, the economic analysis of labor productivity in the region is an important direction of the improvement of the economic mechanism. The analysis of the fulfillment of the comprehensive goal program "Labor," which is called upon to ensure the increase of the efficiency of the use of manpower resources, is acquiring particular urgency. The measures on the decrease of the expenditures of labor, a large portion of which are aimed at the increase of the technical level of production, are playing a vital role in the accomplishment of this task.

In order to increase the effectiveness of the analysis of labor productivity, a unified approach to its making in all the administrative units belonging to the region should be ensured. It should be based on the procedural materials, which specify the sequence, stages, and time of the making of the analysis and the techniques of identifying the influence of various factors on the growth of labor productivity. On this basis the Institute of Industrial Economics of the USSR Academy of Sciences [as published] jointly with the Ukrainian SSR State Committee for Labor and a number of other organizations prepared the Procedural Recommendations on the Analysis of the Fulfillment of the Plan of Labor Productivity and the Elaboration of Measures on the Achievement of the Set Growth Rate of This Indicator in Industry of the Region. They were approved by the Collegium of the Ukrainian SSR State Committee for Labor, the Scientific Expert Council of the Ukrainian SSR State Statistical Administration, and the Bureau of the Economics Department of the Ukrainian SSR Academy of Sciences. They were checked in advance in industry of the Ukrainian SSR and one of the largest regions of the country--Donetsk Oblast. The procedural recommendations have been introduced in 13 oblasts of the Ukrainian SSR and in Kiev. On this basis substantial reserves of the further increase of labor productivity were identified. It seems that the use of this method will make it possible to fulfill more quickly and better the instructions of the 27th party congress on the growth of labor productivity.

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## IMPROVEMENT OF WORK OF MOSCOW SECTORIAL SCIENTIFIC CENTERS

Moscow MOSKOVSKAYA PRAVDA in Russian 16 Apr 86 p 1

[Article: "The Scientific Center of the Sector"]

[Text] "To achieve the thorough technical renovation of the national economy on the basis of the most advanced achievements of science and technology"—the task, which was posed in the Resolution of the 27th party congress in accordance with the Policy Report of the CPSU Central Committee, is unusually difficult and imposing in scale. Moscow scientists and designers are called upon to make a significant contribution to its fulfillment—for the main scientific research institutes and design bureaus in the overwhelming majority of directions of science and technology operate precisely in the capital. How are they coping with their own tasks and how successfully are they playing the role of centers of scientific and technical progress in the different sectors of the national economy?

Tens of invisible threads link the All-Union Institute of Electrical Engineering imeni V.I. Lenin with the enterprises of the sector. The scientists of the All-Union Institute of Electrical Engineering imeni V.I. Lenin conceive quite clearly the real requirements of production, the program of the development of each of the partner enterprises, and the general tasks of the electrical equipment industry. Accordingly, the themes of developments are also defined specifically, with a clear view of the solution of some technical and technological problems or others and with the specification of the deadlines of the practical implementation of the results. The party committee, which is keeping under control both the strategy of the planning and distribution of the loads among departments and laboratories and the progress of the fulfillment of the schedules and deadlines of the turning over of documents to production workers, is coordinating this work. It is also important that the collective of the institute is striving to combine the interests of today and the immediate future of the sector with the use of the boldest, most promising scientific and technical solutions. Particular attention is being devoted to the increase of the efficiency of the operation of equipment and the saving of energy and raw material resources.

Such an approach also distinguishes the work of the Scientific Research Institute of the Tire Industry, the Scientific Research Institute of the Watch Industry, and a number of other sectorial institutes. Here the collectives



are concerned not only about the number and accounting "parameters" of developments, but also about actually determining the directions of scientific and technical progress in their sectors and creating a reserve for the speeding up of the intensification of production during subsequent five-year plans.

Unfortunately, the staff members of a number of scientific research and planning and design organizations of the Ministry of the Chemical Industry, the Ministry of Machine Building for Food and Light Industry and Household Appliances, and the Ministry of Construction, Road, and Municipal Machine Building view their role differently, including in the plans such themes, which obviously do not correspond to the best world achievements or are removed from the main, key directions of scientific and technical progress. The poor knowledge of production and the loss of contact of scientific subdivisions with industry even in those sectors, the main scientific research institutes and enterprises of which are located in the same city--Moscow--urgently show here. In this case the party committees of these collectives, as well as of the ministries, which are not making the proper efforts in order to make the participation of scientists and designers in the development of industry most efficient and specific, are displaying inaction. That is why the real return from science in the named and several other sectors is also increasing by no means in proportion to the appearance of new laboratories, design bureaus, and hundreds of new wage rates at existing institutions.

The interaction of scientific research institutes and production within sectors is often organized chaotically, without long-range planning. And that is why frequently even practical, efficient innovations "lie a long time on the shelves"--the production workers were not ready for their introduction, or else purchased similar licenses abroad. The fate of many of the 500 developments, which are suitable for use, but have so far not been introduced and were discussed at the recent plenum of the Moscow City Committee of the CPSU, is precisely such. The task posed at this plenum--that at scientific research institutes and design bureaus, as a rule, 70 percent of the resources would be connected with the development of specific designs and that precisely the introduction of innovations would become the main indicator when evaluating the work of scientific collectives--has a direct bearing on the guidelines of the reorganization which is underway today in sectorial science of the capital.

When the affairs of an enterprise are going not very well, with the maximum tension, it appeals to the nearest partners for aid. The Serp i molot Metallurgical Plant is also no exception. The dragged out renovation of the enterprise faced the collective with many difficult problems. And not by chance are specialists of sectorial science among those who today are striving especially actively to help the production workers. Party committees of the plant and the Central Scientific Research Institute of Ferrous Metallurgy, for example, jointly discussed the five-year plan of the use during the renovation of Serp i molot of the most effective achievements of science and technology and outlined a program of the participation of the specialists of the institute in the solution of the most important problems--moreover, at a most modern level.

While here is an example of the opposite quality. It is possible to explain the case cited in one of the letters to the editorial board only by negligence, incompetence, and the penchant for ostentation which has outlived itself. The drawing up of recommendations on the optimization of working conditions at the construction site in the Arctic of a railway line system was included in the plan of the All-Union Scientific Research Institute of Railway Hygiene for this year. They planned the start of the work on the theme for January and the completion for December. But here is what is most interesting of all: the construction of this section of the route should be completed...in the middle of this year. Thus, the recommendations for the construction workers will arise already after the construction workers place the object into operation. About what kind of competence here and about what knowledge of the needs of the sector is it possible to speak! Incidentally, it is no wonder that this occurred precisely at the All-Union Scientific Research Institute of Railway Hygiene. Judging from the editorial mail and the appeals to the newspaper of a number of staff members of the institute, total disorder reigns today in the collective. One also cannot speak about any creative, comradely, businesslike atmosphere. Personnel problems are being solved subjectively, in a strong-willed way. Here are the corresponding results....

At the 27th party congress the task was posed "to achieve the vigorous turn of science toward the needs of the retooling of the national economy and to link it more closely with production." And the increase of the return of sectorial institutes was named among the main reserves of its accomplishment. Precisely they now constitute a large portion of the scientific industry of the capital. Thus, the rayon committees of the CPSU should also devote daily, closest attention to the questions of the improvement of their work—as they are doing, for example, in Leninskiy, Krasnogvardeyskiy, and several other rayons. It is necessary to disseminate the know-how of the best in the shortest time.

This is all the more necessary as the recent plenum of the Moscow City Committee of the CPSU outlined specific steps on the increase of the accountability of scientific collectives for the practical return of developments. A strict, but just version was proposed: if during the 5-year period a large output of "products" is not obtained at the scientific institution, on the basis of a state check such scientific research institutes and design bureaus are eliminated either completely or in part, by departments. This will help not only to solve a number of problems with personnel of the highest skills, not only to combat the dispersal of state assets, but also to create in scientific collectives an atmosphere of demandingness, adherence to principles, and a steady orientation toward the end result. Here the position of the communists is especially important. Their task is to show an example of consciousness and enthusiasm, a creative mood, and the aspiration to establish lasting contacts with production. Without this the scientific center of the sector cannot exist today.

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## ROLE OF S&T PROGRESS IN IMPLEMENTATION OF PARTY STRATEGY

Moscow PRAVDA in Russian 30 May 86 p 2

[Article by Doctor of Historical Sciences Professor I. Vorozheykin: "On the Basis of Scientific and Technical Progress. The 27th CPSU Congress: The Strategy of Acceleration"]

[Text] At the present historical stage the task of the more complete and efficient use of the possibilities and advantages of socialism and the achievement of a new qualitative state of society faces our party and the Soviet people. It is possible to accomplish it only by the acceleration of the socioeconomic development of the country, the essence of which, as was noted in the Policy Report of the CPSU Central Committee to the 27th party congress, consists in a new quality of growth: the utmost intensification of production on the basis of scientific and technical progress, the structural reorganization of the economy, and efficient forms of the management, organization, and stimulation of labor.

Consequently, the acceleration of scientific and technical progress is today the basic question of the economic strategy of the party. This is the real lever, by means of which it is possible to accomplish the new technical renovation of the USSR national economy, to ensure the success of the intensification of the economy, and to achieve a significant increase of production efficiency.

The rapid updating of the production system by the extensive introduction of advanced equipment, the most advanced technological processes, and flexible systems is of vital importance for the transformation of the material and technical base of society. For these purposes it is necessary to conclude complete mechanization in all the sectors of the national economy, to make substantial progress in the automation of production, to carry out on an increasing scale its electrification, chemicalization, robotization, and computerization, and to use biotechnology.

As we see, the party is directing attention not to the simple improvement of operating technologies and the partial modernization of machines and equipment, but to the cardinal updating of fixed capital, the retooling of all the sectors of the national economy, and the changeover to fundamentally new technological systems and to equipment of the latest generations, which yield

the greatest efficiency. Among such technological systems are, for example, the converter production of steel with the continuous casting and controlled rolling of metal, rotary and rotary conveyor lines in mass industrial production, intensive technologies in farming and animal husbandry, and flexible machine systems in machine building. During the 12th Five-Year Plan it is planned to obtain not less than two-thirds of the increase of labor productivity by the use of the achievements of science and technology. Of course, this does not free us of the need to strive for the maximum utilization of operating equipment and the increase of its shift coefficient.

Scientific and technical progress should be aimed at the radical improvement of the use of natural resources, raw materials, materials, fuel, and energy at all stages—from the extraction and complete processing of raw materials to the output and use of the final product. And the main means is the utmost economy and the extensive introduction of resource-saving technologies. Increased indicators on economy and resource saving have been established for the 12th Five-Year Plan. It is envisaged already in 1986 to ensure by means of the saving an increase of the need of the national economy with respect to rolled ferrous metal products by 67 percent, with respect to fuel and energy resources—by 51 percent, with respect to cement—by 93 percent, and lumber—by 69 percent. The relative saving of material expenditures will come to 3.6 billion rubles.

The acceleration of scientific and technical progress is impossible without a high quality of the product. Today the task of the utmost increase of its technical level and quality is being brought to the center of the economic policy of the party and all party work. The accomplishment of this task is a reliable means of the intensification of the economy and the more complete meeting of the needs of the country for necessary items and of the increasing demand of the population for various goods. The orientation toward the development of equipment and technology, which surpass in their parameters the best world models, is directly connected with this.

A decisive condition of the acceleration of scientific and technical progress is the creative activity of the Soviet people. The initiatives and undertakings of many labor collectives, which have been endorsed by the CPSU Central Committee: the Intensification-90 Program, which was formulated by the people of Leningrad, the carrying out of the certification of workplaces and their rationalization at the Dnepropetrovsk Combine Plant imeni K.Ye. Voroshilov, the intense assignments for the 12th Five-Year Plan of the workers of the Volzhskiy Association for the Production of Passenger Cars from the city of Togliatti of Kuybyshev Oblast, the Cherepovets Metallurgical Combine imeni 50-letiya SSSR, such production associations as the Minskiy traktorny zavod and Uralmash Production Associations, and others, convincingly attest to this.

In essence, the acceleration of scientific and technical progress concerns each labor collective and each Soviet individual and it meets the interests of everyone. This is a partywide, national matter. The documents of the 27th CPSU Congress are permeated with the idea of the active cultivation among the Soviet people of a conscious, creative attitude toward labor as the very first social duty. It is important that each person at his place would display a

new approach to work, would work conscientiously, creatively, and to full effect, and would emulate production innovators and genuine masters at their job.

In this respect the role of socialist competition is great. The party is striving to improve the organization and increase the effectiveness of mass competition, to use its mobilizing potentials more fully, and to maintain in every possible way the spirit of initiative and innovation, comradely cooperation, and mutual assistance.

At the same time the yield of competition is not everywhere and not always appreciable, it lacks a clear orientation toward the increase of labor productivity, the improvement of product quality, and the saving of resources. One of the basic causes of this, as was noted at the meeting in the CPSU Central Committee with veterans of the Stakhanov movement and production leaders and innovators in September of 1985, consists in the fact that the forms and methods of competition correspond far from completely to the nature of the present stage of economic development. In many collectives it is proceeding as if by itself, without a firm and thorough connection with the work on the changeover of the economy to intensive means, the acceleration of scientific and technical progress, the reform of the economic mechanism, and the extensive introduction of collective forms of the organization of labor.

In the Policy Report of the CPSU Central Committee to the congress a high rating of the role of socialist competition in the mobilization of the creative forces of the Soviet people is given and it is indicated that it should be aimed at the increase of the quality of work, economy and thrift, and the achievement of the outlined gains in each collective and at each workplace.

The party is directing attention to the need to improve the organization and increase the effectiveness of competition and to treat it as a vital matter of the workers themselves. "Of greatest importance," it is stated in the CPSU Program, "is the utmost support of the initiative and creativity of the masses, which are aimed at the acceleration of scientific and technical progress, the growth of labor productivity, the economical use of resources, the increase of production efficiency and product quality, the decrease of the production cost, the assurance of a precise labor rhythm and the timely fulfillment of contractual obligations, and the achievement of the best national economic results."

The materials of the 27th CPSU Congress and other party documents, in revealing the strategy of scientific and technical progress, clearly specify: what it is necessary to do for the quickest introduction in production of the achievements of science, new equipment, and advanced technologies and on what directions first of all to concentrate the efforts of labor collectives. First of all the increasing role of science in the development of productive forces and the improvement of social relations, in the development of fundamentally new types of equipment and technology, in the increase of labor productivity, in the development of the mineral resources of the earth, ocean, and space, and in the protection and improvement of the environment is taken into account.



It is envisaged by the plans for the 12th Five-Year Plan to enhance the role of academic institutes, to increase substantially the level and effectiveness of sectorial science, to consolidate its plant sector, and to use significantly better the scientific potentials of the higher school. It is intended to introduce extensively new advanced forms of the organization of scientific activity, which make it possible in the shortest possible time to solve important scientific and technical problems, and to establish interbranch scientific technical complexes and centers. The practical task, consequently, is to strengthen the contacts of science and production and to use such organizational forms of their integration, which make it possible to ensure the quick passage of scientific ideas from origination to extensive use.

It is beyond question that the acceleration and the increase of the efficiency of the use of the achievements of science and technology require serious structural changes in the economy and a new approach to investment policy. It is a question of a higher rate of development of those sectors of the national economy, which ensure scientific and technical progress and the successful solution of social problems, of the significant increase of the share of the assets, which are being channeled into the retooling and renovation of operating enterprises in the total amount of productive capital investments, and of the increase in them of the proportion of the expenditures on equipment and machines. The task is being posed to improve the ratio between capital investments and the resource-saving, processing, and consuming sectors in favor once again of the sectors which ensure the acceleration of scientific and technical progress.

The basic tasks of the development of industry for the 12th Five-Year Plan were also specified in conformity with this. It is envisaged, in particular, to ensure the extensive changeover to the output of highly efficient products, the drastic shortening of the time of the assimilation of new equipment and technology, the updating of production by its retooling and renovation, the universal introduction in production of resource-saving types of technology, and the complete use of raw materials. The leading development of machine building, first of all machine tool building, the production of computer hardware, instrument making, and the electrical equipment and electronics industries is planned.

The acceleration of scientific and technical progress, just as of the entire socioeconomic development of the country, is impossible without the development of a flexible system of the management of the economy and the thorough reform of the economic mechanism. It is important to increase the effectiveness of planning and its role in the intensification of the economy on the basis of the active use of the achievements of science and technology and to put to use cost accounting and a set of levers and stimuli, which give real advantages to those who in practice are striving for an increase of production efficiency by its updating and retooling.

In the interests of the further improvement of management it is envisaged during the 12th Five-Year Plan to change all the sectors of the economy over to new methods of management, to combine unified centralized supervision with

initiative, creative activity, and great responsibility at all levels of management for the end results of the work, and to involve the workers more extensively in production management, ensuring the consistent implementation of the provisions of the USSR Law on Labor Collectives.

Of course, steps on the tightening up of organization, discipline, and order in all units of production and management and the skillful use of moral and material stimuli, which give full play to the initiative and creativity of people, are an indispensable condition of the acceleration of scientific and technical progress. It is important, on the one hand, to cultivate more actively in each person awareness of the need to work conscientiously for the common good and, on the other, to improve persistently the material incentive, to provide in practice the conditions, under which it is advantageous for labor collectives to produce and introduce new equipment, to produce products of the highest quality, and to increase labor productivity continuously.

Lenin's formula: the new society is being formed not on enthusiasm directly, but by means of the enthusiasm, to which the great revolution gave rise, on personal interest, on personal motivation, and on cost accounting, is well known. This formula, M.S. Gorbachev noted, also completely retains its topicality in our times. For the attitude of man toward labor, his creative activity, and output in work are the central question of the implementation of the plans outlined by the party, including in the area of scientific and technical progress. Therefore, it is also necessary to encourage in every possible way—both orally and materially—conscientious, highly productive, high-quality labor.

The CPSU Congress provided our people with a program of specific actions. The Soviet people clearly understand how important it is in the interests of the acceleration of the socioeconomic development of the country to lend powerful stimuli to the increase of productive forces and to scientific and technical progress and to use skillfully the enormous reserves of the national economy.

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## FACILITIES AND MANPOWER

### SKILLS DESCRIPTIONS OF SCIENTIFIC ASSOCIATES

Moscow EKONOMICHESKAYA GAZETA in Russian No 17, Apr 86 p 18

[Article under the rubric "New Official Materials": "The Skills Descriptions of Scientific Associates"; first two paragraphs are EKONOMICHESKAYA GAZETA introduction; capitalized passages published in all capital letters]

[Text] The USSR State Committee for Labor and Social Problems has approved the skills descriptions of the positions of scientific associates, scientific secretary, and heads (chiefs) of scientific research subdivisions of scientific research institutes (institutions), which are drawn up with the participation of the USSR Academy of Sciences and the State Committee for Science and Technology and were submitted for approval to the All-Union Central Council of Trade Unions. They are being introduced at the scientific research institutes (institutions), which have been changed over to the conditions of the remuneration of labor, which are envisaged in the decree of the CPSU Central Committee, the USSR Council of Ministers, and the All-Union Central Council of Trade Unions "On the Improvement of the Remuneration of the Labor of Scientists, Designers, and Process Engineers of Industry."

At the request of the readers the new skills descriptions of the positions of scientific associates of such institutes (institutions) are cited below.

#### Chief Scientific Associate

OFFICIAL DUTIES. Carries out the scientific supervision of the conducting of research on the most important scientific problems of a basic and applied nature, including in accordance with scientific and technical programs, directly participates in its conducting. Formulates new directions of research and development, organizes the drawing up of the program of operations, specifies the methods and means of their performance. Participates in the formulation of the plans of scientific research work, coordinates the activity of the coperformers, who are taking part in case of the joint performance of operations with other organizations in the assignments which have been entrusted to him. Generalizes the obtained results, makes a scientific research appraisal of the completed research and development. Carries out the supervision of the experimental checking of their results. Determines the sphere of application of the results of scientific research and development and ensures the scientific supervision of

the practical implementation of these results. Carries out the training and the improvement of the skills of scientists in the corresponding field of knowledge.

**SKILLS REQUIREMENTS.** The academic degree of doctor of sciences. The availability of important scientific works or certificates for discoveries and certificates of authorship for inventions, as well as results which have been implemented in practice. Scientific prestige in the corresponding field of knowledge.

#### Leading Scientific Associate

**OFFICIAL DUTIES.** Carries out the scientific supervision of the conducting of research on individual problems (themes, assignments) of science and technology and heads the group of personnel who are engaged in it or is the responsible performer of individual assignments of scientific and technical programs. Elaborates scientific and technical solutions with respect to the most difficult problems and the methods of conducting research and development, selects the means necessary for this. Substantiates the directions of new research and development and the methods of their conducting, introduces suggestions in the plans of scientific research. Organizes the drawing up of the program of operations, coordinates the activity of the coperformers in case of the joint fulfillment of operations with other organizations in the assignments entrusted to him, generalizes the obtained results. Determines the sphere of application of the results of research and development and organizes the practical implementation of these results. Carries out the training of scientists and participates in the improvement of their skills.

**SKILLS REQUIREMENTS.** The academic degree of doctor or candidate of sciences. The availability of scientific works or certificates of authorship for inventions, important designs and developments.

**THE CHIEF SCIENTIFIC ASSOCIATE AND THE LEADING SCIENTIFIC ASSOCIATE SHOULD KNOW:** the scientific problems of the corresponding field of knowledge, science, and technology, the directions of development of the sector of the national economy, the guidance materials of superior organs, the domestic and foreign achievements with respect to these questions; the latest methods, means, and practice of the planning, organization, conducting, and introduction of research and development (evaluation, patent information supply, the publication of scientific and technical documents, and so forth); the forms of the economic stimulation and material incentive of personnel; the principles of the scientific organization of labor; the regulations and norms of labor safety procedures, labor safety techniques, industrial sanitation, and fire protection.

#### Senior Scientific Associate

**OFFICIAL DUTIES.** Carries out the scientific supervision of a group of personnel in case of the study of individual themes, as well as developments, which are a portion (section, stage) of the theme, or conducts research and

development as the performer of the most difficult and responsible operations. Formulates the plans and procedural programs of the conducting of research and development. Organizes the gathering and study of the scientific and technical information on the theme, carries out the analysis and theoretical generalization of scientific data, the results of the experiment, and observations. Checks the correctness of the results which have been obtained by the staff members who work under his supervision. Takes part in the improvement of the skills of personnel. Introduces the results of the conducted research and development.

**SHOULD KNOW:** the scientific problems with respect to the themes of the research and development being conducted, the guidance materials with respect to the corresponding fields of science and technology or the national economy, the domestic and foreign information on these questions; the present methods and means of the planning and organization of research and development, the conducting of experiments and observations, including with the aid of electronic computer hardware; the principles of the economics of the corresponding sector of production and the scientific organization of labor; the regulations and norms of labor safety procedures and labor safety techniques, industrial sanitation, and fire protection.

**SKILLS REQUIREMENTS.** A higher education and work experience in the corresponding specialty of not less than 10 years, the availability of certificates of authorship for inventions or scientific works. If an academic degree is available, without the making of demands on the length of service.

#### Scientific Associate

**OFFICIAL DUTIES.** Conducts research and development on individual sections (stages, assignments) of the theme as the responsible performer or jointly with scientific supervisors, conducts difficult experiments and observations. Gathers, processes, analyzes, and generalizes scientific and technical information, advanced domestic and foreign know-how, the results of the experiment and observations. Participates in the formulation of the plans and procedural programs of research and development, practical recommendations on the use of their results. Draws up reports (sections of the report) on the theme or its section (stage, assignment). Participates in the introduction of the results of research and development.

**SKILLS REQUIREMENTS.** A higher education and work experience in the corresponding specialty of not less than 5 years, the availability of certificates of authorship for inventions or scientific works. If an academic degree is available, without the making of demands on the length of service.

#### Junior Scientific Associate

**OFFICIAL DUTIES.** Under the supervision of the responsible performer conducts research and development on individual sections (stages, assignments) of the theme in conformity with the approved methods. Participates in the conducting of experiments, makes observations and measurements, draws up their description, and formulates the conclusions. Studies the scientific and technical information, domestic and foreign experience with respect to the



themes being studied. Draws up reports (sections of the report) on the theme or its section (stage, assignment). Participates in the introduction of the results of research and development.

**SKILLS REQUIREMENTS.** A higher education and work experience in the corresponding specialty of not less than 3 years. In case of the availability of an academic degree, the completion of graduate studies, and the performance of field work, without the making of demands on the length of service. In case of the availability of recommendations of councils of higher educational institutions (faculties) the graduates of higher educational institutions, who have received work experience during the period of training, can be appointed as an exception to the position of junior scientific associate.

**THE SCIENTIFIC ASSOCIATE AND THE JUNIOR SCIENTIFIC ASSOCIATE SHOULD KNOW:** the goals and tasks of the research and development being conducted, the domestic and foreign information on these research and development; the present methods and means of the planning and organization of research and development, the conducting of experiments and observations, the generalization and processing of information, including with the use of electronic computer hardware; the principles of the scientific organization of labor; the regulations and norms of labor safety procedures and labor safety techniques, industrial sanitation, and fire protection.

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HIGH ENERGY LABORATORY OF JOINT INSTITUTE FOR NUCLEAR RESEARCH

Moscow LENINSKOYE ZNAMYA in Russian 16 Feb 86 p 4

[Article by Academician Aleksandr Mikhaylovich Baldin, director of the High Energy Laboratory and USSR State Prize winner, under the rubric "First the Theory": "On the Advantage of the Exact Sciences"]

[Text] Basic research constitutes the basis of the scientific activity of the laboratory. Unfortunately, in the press and in popular, and at times even scientific literature by basic research there is often understood all research which does not have a direct, immediate practical yield, research for the sake of the clarification of one phenomenon of nature or another and the discovery of a new, previously unknown effect.

But the classics of natural science and the methodologists of science give an unambiguous answer to the question: the study of which phenomena and laws yields fundamentally new knowledge and provides a real outlet to the foundation of science and, consequently, practice. This is the study of phenomena, the very existence of which goes beyond the framework of the established laws of nature. For the highest goal of the work of the physicist is the establishment of elementary laws, from which by means of logic and mathematics it is possible in principle to derive a picture of the world. While by studying phenomena which obey previously established laws, you will not discover new elementary laws. Among the phenomena, which obey previously established laws, there can be such ones, the discovery of which is very useful for the development of new technologies, new equipment, and instruments. But it is also necessary to evaluate them not according to the criterion of fundamentality, but according to their economic utility.

Thus, the obtaining and generalization of experimental facts, which go significantly beyond the framework of established laws, are the basic means of the development of the basic sciences. However, the obtaining of such facts is becoming a more and more difficult scientific and technical task. The great competition in this area requires the enlistment of considerable physical assets and much assistance of entire collectives of engineers, technicians, and workers of the highest skill. The latest means of data processing--computers and automatic scanning and measuring devices--are needed. The participation of industrial enterprises is needed.

The establishment of large research centers became for a number of states a too difficult task, therefore, the need for international cooperation also arose. The Joint Institute for Nuclear Research has become one of the largest centers in the world. I would like to emphasize that competition in science is a powerful stimulus for the development of new technologies, methods, devices, and instruments, which provide a large outlet, which can be estimated economically, into technology and related fields. There even exists the opinion that what are called the "secondary yields" of the basic sciences provide more than does goal-oriented applied research.

I clearly understood the great importance of the Joint Institute for Nuclear Research for the creation of the scientific and technical potential of the member countries, having visited many scientific centers. I conversed with a minister of the Japanese Government who visited the Joint Institute for Nuclear Research several years ago for the purpose of studying the experience of establishing, as they are now called, TsBN--centers of large-scale science--made an especially great impression on me.

Precisely the scientific and technical potential enabled Japan in a short time to restore the economy which had been destroyed by the war. But whereas during the restoration period the industry of Japan was developed on the basis of the purchase of licenses and the assimilation of the secondary yields of basic science of other countries, later the leaders of the state understood: in this way it is possible merely to catch up, but it is impossible to achieve the position of the leader.

By the way, the Joint Institute for Nuclear Research also has extensive contact with applied institutes, scientific research associations, and plants. It is characteristic: we do not have the so-called problem of the introduction of new equipment. Engineers seize technical innovations immediately. Our electronics, computer technology, and automatic equipment enjoy their special attention. At one time they literally stood in line for specialists of Dubna for technical assistance, documents, and technologies. This stems from the fact that owing to scientific operations with representatives of various countries and rigorous competition we are adopting the most advanced know-how in the world and are quickly using it, by adapting all innovations of technology and developing our own.

Our modular electronics and computer programs are in particular demand--the level of automation in high energy physics in both the East and West significantly exceeds the level of automation in any other field.

The fate of coordinate detectors of ionizing rays formed in an interesting way. These are such planes which make it possible to record the passage of particles through any point of them. The information is immediately transmitted via electronics and a computer to a television screen in converted form. The development of these detectors caused a revolution not only in experimental high energy physics. They made it possible to develop fundamentally new instruments for nuclear medicine--roentgenology and radiology, for microbiology, material science--the automation of crystallographic methods, and a number of other fields. The problem of introduction did not arise with coordinate detectors. We are also now not



able to meet all the requests of the large collectives which are responsible for the introduction of new equipment.

I can cite a similar example in connection with the development in our laboratory of new technologies in the area of cryogenics, technical superconductivity, and the obtaining of an ultrahigh vacuum. The experiments at the High Energy Laboratory were the first among the experiments at the largest accelerator in the world near Chicago. They marked the beginning of Soviet-American scientific and technical cooperation, this occurred, one must think, because the Americans, not having the corresponding technology, were forced to request the services of our engineers and physicists for joint work. Even during the times of the coolest relations our cooperation continued.

What are our main achievements in the area of purely basic research? I will dwell on one which it is also possible to explain to nonspecialists.

Everyone is familiar from the physics textbook for the 10th grade with the structure of the atomic nucleus. This is a system made up of protons and neutrons. The proton-neutron model of the nucleus is one of the greatest achievements of the physics of the microcosm, which are of the greatest importance for the practical activity of man.

And it was demonstrated by experiments of our laboratory that there exists such a sphere of phenomena, in which the proton-neutron model becomes inconsistent, while the atomic nuclei begin to behave as quark-gluon systems. Fundamentally new laws of nature operate in this sphere of phenomena, it has already been possible to formulate several of them. A new field of science emerged--relativistic nuclear physics, which, in my opinion, constitutes the main prospect of basic research in nuclear physics.

We opportunely converted the famous Dubna synchrophasotron into the first and truly largest accelerator in the world of atomic nuclei, which move at the speed of light, and developed instruments, which reliably register the collisions of such nuclei and record enormous amounts of information. We are relaying this information to a large number of research institutes of the socialist countries, which deal with "remote physics," and to centers of the Soviet Union. The supply of about 1,000 researchers with such information is our contribution to the scientific and technical potential of the homeland.

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SCIENTIFIC RESEARCH, TECHNOLOGICAL INSTITUTE OF MICROELECTRONICS

Yerevan KOMMUNIST in Russian 18 Apr 86 p 4

[Article by V. Musayelyan: "Intended for Microelectronics"]

[Text] The NITIM is the Scientific Research and Technological Institute of Microelectronics. The direction of the scientific research of the collective is microminiaturization, the decrease of the materials-output ratio and power consumption in the process of operating the equipment being developed. The solution of the vital problems of modern production--the development of industrial robots, automated systems, and flexible production modules--is not feasible without microelectronics.

The development of control and measuring equipment for the determination of the parameters of microcircuits in the technological process is the problem which is being worked on by scientists--engineers and designers of the scientific research institute.

One of the devices, which was developed in the division which L. Gasparyan manages, is a synthesis of a computer, a laser unit, automatic equipment, and mechanisms of the most fine mechanics. Its purpose is the determination of the defectiveness of microcircuits.

The laser beam, which is focused on a point, with a diameter of 0.01 millimeter moves on an area measuring 0.05 X 0.06 millimeter. The step of displacement is visible only under a microscope. A Japanese firm--one of the recognized authorities in the area of microelectronics--also purchased these devices. The laser scanning microscope, which makes it possible to check all the stages of the formation of microcircuits, is also unique.

A complex of small devices and systems for the measurement of the parameters of microcircuits of a new generation of color televisions and video recorders is being developed in the division managed by M. Pogosyan. The creative research led to the development of standardized electronic modules and blocks, which made it possible to decrease to one-half the labor intensiveness of production and to shorten the process of adjusting the equipment.

The development of internal memories for microcomputers and minicomputers on flexible magnetic disks is the object of the efforts of the collective of the

division, of which A. Gutov is in charge. This direction of development was begun here for the first time in our country and is new for the institute. Three base models have been developed. Each of them is noted for the compactness and size of the memory, a reduced materials-output ratio and power consumption.

The workers of the Scientific Research and Technological Institute of Microelectronics also have many other original valuable developments. The creative forces of the collective are aimed at the solution of the key problems of the acceleration of scientific and technical progress.

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## SECONDARY VOCATIONAL, TECHNICAL SCHOOL FOR BIOLOGISTS

Tbilisi MOLODEZH GRUZII in Russian 4 Jan 86 p 3

[Interview Candidate of Biological Sciences Anton Antonovich Dzeladze, director of Independent Secondary Vocational and Technical School No 59, by I. Barbakadze under the rubric "The Premiere of...the Vocational and Technical School": "Toward the Secrets of the Microcosm"; date, place, and occasion not given; first paragraph is MOLODEZH GRUZII introduction]

[Text] This vocational and technical school is not yet in the directories. But more than 200 children are already assimilating at it the occupation of laboratory assistant of biochemical analysis. Enrollment was carried out at the base of Vocational and Technical School No 138, but since the first days of this year the affiliate has acquired the status of Independent Secondary Vocational and Technical School No 59. One of the first in the country, it is training specialists of the biological type. Its director, Candidate of Biological Sciences Anton Antonovich Dzeladze, tells about the tasks and plans of the school.

[Answer] The opening of our school is connected with the shortage of personnel at two organizations--the Scientific Research Institute of Vaccines and Sera of the USSR Ministry of Health and the Georgian Biological Combine of the USSR Agroindustrial Association. Research on the improvement and development of compounds, which affect the immunological system of man and animals, is being conducted at it. Specialists with a secondary specialized education, who know the fundamentals of chemistry, biology, bacteriology, and a number of other subjects, are needed for work at them. Perhaps, Mikhail Isakovich Dalakishvili, director of the Georgian Biological Combine, who displayed personal interest and initiative in the establishment of our school, was our "godfather."

[Question] The type of school is new and unusual, have you probably approached in a special way the selection of students and teaching personnel?

[Answer] Imagine that admission in September had to be carried out by competitive selection, the number of people wanting to study here was so great. We admit on the basis of 8 and 10 grades. I will note that we have few children who came with excellent and good certificates. At the school

there is also the group of mechanics and repairmen, the graduates of which will work at the large fleet of the biological combine.

The instructors of special subjects here are workers of the two base organizations. Doctor of Medical Sciences Professor A. Meipariani, for example, teaches microbiology. Candidates of sciences and senior scientific associates teach through the combining of jobs. In short, skilled experienced workers who, in turn, are very interested in the training of their future assistants. In general, I want to note that our base organizations are doing everything possible so that the school from the very start of its activity would be noted for a high level of instruction. A portion of the students are studying at Tabakhmela, where the biological combine has set aside a special building, a portion are studying at the Institute of Vaccines and Sera. Even such a minor detail--as soon as the selection was made, Bakteriofag began to worry about special work clothing for our students--attests that the base organizations are trying to provide for all the possible needs of the new school.

[Question] And does one of the peculiarities of instruction probably consist in the fact that the children from the first days of studies are closely linked with practical work at the base organizations?

[Answer] Of course, they help their senior comrades in laboratory work and research. Today we are already also seeing to the assignment of our graduates. This spring 160 people will graduate from the school. Of course, the base organizations do not need such a number of specialist, but we also have orders of the Scientific Research Institute of the Food Industry, the chemical and pharmaceutical plant, and the plant of organotherapeutic compounds. In the future, apparently, we will establish close contacts with interested specialized organizations of Moscow and Perm. Our students will do practical work there. So that the prospects of the school are considerable, for we are training specialists of tomorrow.

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## AUTOMATION AND INFORMATION POLICY

### DATA PROCESSING SYSTEM OF LITHUANIAN STROYBANK OFFICE

Moscow DENG I KREDIT in Russian No 2, Feb 86 pp 65-67

[Article by S.I. Mayevskiy, chief of the computer center of the Lithuanian Republic Office of the All-Union Bank for Financing Capital Investments"]

[Text] It is well known that the use of mathematical economic models and the timely and high-quality processing and complete use of information in many respects are conducive to the increase of the efficiency of the process of management and shorten the time of decision making. Indeed, the timeliness and soundness of management decisions depend on the efficiency and reliability of the results of data processing. Moreover, the use of computer hardware, which realizes the possibilities of mathematical economic methods, makes it possible to solve the problems which are connected with the search for the optimum decisions.

However, the development of automated control systems and automated information systems in the economy, which is being carried out extensively, continues to remain a labor-consuming and expensive process, while some of the developed systems are not being used efficiently enough. Therefore, the search for new, more efficient methods of both the development of such systems and the organization of the optimum technological process of data processing should be regarded as one of the main goals when developing and improving the automated data processing system of institutions of the All-Union Bank for Financing Capital Investments.

The republic office of the All-Union Bank for Financing Capital Investments is seeking means of increasing the efficiency of the operation of the existing data processing system. The experience, which has been gained by the computer centers of the offices of the All-Union Bank for Financing Capital Investments for the processing of the data of the banks, shows that bank information has a number of peculiarities and the need for it of the Board, the structural subdivisions of the office, and its institutions is different.

The great centralization of information in the systems of the republic offices is characteristic of the bank, which is being taken into account when developing the software of problems of the ASU-Stroybank. The computer centers of the republic offices of the All-Union Bank for Financing Capital



Investments, which are equipped with computer hardware of the same type, are provided in a centralized manner with developed sets of problems or individual problems, for which the technology and methods of solution have been specified. The sectorial departments of the system of the republic office can successfully fulfill their functions only when they are provided with information which has been prepared by the institutions of the bank. For example, the regulation of the limits of financing is carried out by the economic planning administration of the republic office after the receipt of data from all the institutions of the office. An analysis of the effectiveness of capital investments and the degree of their concentration with respect to the economy of the republic and by ministries and departments of union republic and union subordination can be made only by the sectorial administrations and departments of the republic office on the basis of the data of the institutions of the All-Union Bank for Financing Capital Investments. The analysis of the degree of supply of construction with equipment and the timeliness of the installation of equipment is identical.

Experience shows that for the analysis of the most different questions by the republic office of the All-Union Bank for Financing Capital Investments the basic information is requested from the institutions of the bank. The principle of the centralization of information was also decisive in the organization of the economic work of the bank, as well as in the organization of the prevailing technological process of data processing at the institutions of the republic offices, which is characterized by the following peculiarities: a high labor intensiveness at the stages of gathering, recording, checking, and primary processing, since all the operations are performed by the "manual" method with the use of electronic keyboard computers; the preparation of the data on paper media (punched tape) for delivery to the computer center; the use of the modes of batch processing and batch teleprocessing following the "tape--telegraph channel--tape" pattern; high operating expenditures on the preparation and transmission of data to the computer center for processing; the inadequate efficiency of the preparation of information and its transmission; a centralized method of data processing.

The analysis of the prevailing technology of data processing attests to the need for its further qualitative improvement.

The improvement and development of the automated data processing system should, in our opinion, be carried out in stages. First, it is necessary to expand the existing system of automated data processing, having elaborated additional problems, and at the same time to improve the technology of the computing process within the limits of the possibilities of the existing hardware complex (KTS); second, to develop an automated data processing system with fundamentally new possibilities on the basis of mathematical economic methods and advanced and promising means and methods of data processing, which are based on automated data banks, and with the use of the principles of the integration and teleprocessing of data.

Such development of the automated data processing system will make it possible to use more efficiently the available hardware complex and to gradually prepare the workers of the bank for a higher level of the organization of work

under the conditions of the automated control system and will afford the opportunity to improve significantly the technology of data processing on computers both at the republic office itself and at its institutions, as well as to accomplish the gradual complete retooling of the computer centers and institutions of the republic office.

On the basis of the new hardware complex an integrated data processing system is being developed as a new stage in the development and improvement of the automated control system of the republic office of the All-Union Bank for Financing Capital Investments. Data teleprocessing in the "computer-channel-computer," dialogue, and "request-response" modes is becoming the leading means of the organization of data processing, the implementation of the proposed modes of data processing is possible only on the condition of the establishment of an information computer network (IVS) of the republic office of the All-Union Bank for Financing Capital Investments as the basic material base of the development of the automated data processing system. In this connection the question of the choice of the method of the organization of data processing in the centralized or decentralized mode and the distribution of computer resources in the information computer network is arising. Since it is impossible to determine clearly the advantages of one method or another, let us dwell on this important question in somewhat greater detail.

Centralization, or the uniting of means of data processing, entails significant changes. Modern hardware, software, and communications equipment for data transmission are made available to the users for the solution of problems on the central computer. The users are provided with data through transmission lines.

The gain, which takes the form of the decrease of expenses as a result of the replacement of many decentralized units with a larger centralized system, can be significant. It is necessary to take into account the other types of the saving which is obtained due to the centralization of data processing aids: the need for space for service facilities, operating and auxiliary personnel, and a specific number of sets of software and its maintenance disappears. The operating expenses on the management of databases and the material service and maintenance of computer devices (systems) decrease, which increases the efficiency of the central computer.

For the establishment of the efficiency of one mode or another of data processing one should take into account the expenditures on communications, which include the expenditures on various data processing devices and centers. The number of lines between the devices and centers is increasing many fold more rapidly than the number of computer centers which are interlinked for the transmission of data to each other.

Let us designate by  $l$  the number of communications lines and by  $n$  the number of centers; then the relationship between the variables can be expressed by the following equation:  $l = 0.5n(n-1)$ , that is, the number of communications lines between the computer devices and computer centers increases significantly more rapidly than the number of computer centers which are being established in the network.

Centralization provides an advantage in case of the making of changes in the problems being solved, which in practice are made locally, at the data processing center. In exactly the same way the centralization of computing aids facilitates the elaboration and introduction of applied problems. On the other hand, the centralization of computer resources also has its advantages. In particular, locally as a result of the better knowledge of specific conditions information of a higher quality is generated. The cost of the processing of a unit of data in this case is higher, but the timely receipt of information of a higher quality, as some specialists believe, justifies the additional costs. Moreover, the opportunity exists to redistribute computer resources in cases of the increase of the load, which is impossible under the conditions of centralization. The opinion that centralized data processing meets more slowly the requests of remote users, also exists.

Both approaches: the centralized approach and the decentralized approach, which has been finding application in recent years, are being used in the practice of data processing. A number of specialists in the field of data processing believe that data processing locally (the decentralized method) in the future will receive greater dissemination, and at present hardware and software are being intensively developed for this purpose. The analysis of foreign experience shows that some firms, which are reorganizing their data processing facilities, are choosing structures which are somewhere in the middle between the two polar methods: unification and dispersal. For example, the large computers and several information systems, which encompass all the subdivisions of the company, are being centralized, peripheral computers are being maintained at the majority of enterprises, and at each one there is a small group of systems specialists and programmers, who have a set of programs, which is intended for this enterprise.

The study of the methods of distributing computer resources made it possible to establish that the decrease of the cost of developing software to such a level, at which interactive systems with terminal devices become more and more economically justified in the different areas of use, is the basic argument in favor of decentralized data processing. In our opinion, the use of a computer like the minicomputer or microcomputer and individual computers is economically more justified as compared with the use of a large general-purpose computer complex under the following conditions: 1. The common task being performed can be divided into independent parts; 2. The users of the terminals are geographically removed from each other; 3. The functions of the different centers are sufficiently independent.

The use of minicomputers and microcomputers ensures the end users the possibility of the organization of data processing, access to databases with the aid of video terminals, and the development of efficient systems of data processing with a lower cost of the hardware; the gradual building up of the hardware complex in accordance with the extent of the need and the degree of assimilation; the increase of the reliability of the system by means of the division of the hardware into independent computer complexes, which decreases significantly the likelihood of their simultaneous breakdown; the possibility of reducing the expenditures on data transmission.



When determining the degree of economy of decentralized data processing it is necessary to take into account such factors as the checking of the operation of the system, the management of the database, and the support of a specific number of service personnel, since all this affects the expenditures on the data processing system. In case of centralized monitoring the overall management of the system improves and the labor expenditures decrease. The efficiency of the use of computers by the users can be different, therefore, the decentralization of databases can be a factor which increases the cost of data processing. The database can be broken down in accordance with the indicator of the geographic remoteness of the users of the computer or from a functional point of view. The exchange of data can be organized via communications channels, if there is no opportunity to distribute the database in the optimum manner.

At the All-Union Bank for Financing Capital Investments an overwhelming number of economic problems are solved in a centralized manner by the computer centers of the republic and oblast offices on general-purpose computers like the YeS or computer complexes like the M5000-M5010. The solution of problems is carried out in the batch mode, owing to which a significant number of personnel are needed for the support of the computing process. The decentralization of these problems can cause the need for the decentralization of data processing and the increase of the number of service personnel, while the expenditures connected with this would decrease the advantage which could be obtained through decentralization.

The experience of the use of Iskra-226 microcomputers for the local processing of accounting data at the Gatchina Division of the Leningrad Oblast Office of the All-Union Bank for Financing Capital Investments showed that microcomputers have a sufficient reliability which makes it possible to use them offline, when maintenance is centralized.

The use of microcomputers at the institutions of the All-Union Bank for Financing Capital Investments will make it possible to organize the local processing of the data of accounting, settlements, and reporting with the subsequent transmission of some intermediate and final results to the computer center of the republic office and the preparation, gathering, and preliminary processing of the technical and economic indicators of construction projects, contracting, planning, and surveying organizations, and institutions of the bank.

The computer facilities of the institutions of the bank (the city administrations and departments) under the conditions of the information computer network should ensure the preparation and gathering of information, the preliminary processing, local processing, accumulation, storage, and exchange of information between the institutions and computer center of the bank. The hardware of the computer center as the main data processing center of the republic office supports all the types of data processing, the accumulation, storage, and exchange of information with all the institutions of the bank and territorial financial, credit, and planning organs, and provides the central staff and management with the necessary resulting information. Under the conditions of the functioning of the information

computer network of the republic office of the All-Union Bank for Financing Capital Investments the principle of both centralized and decentralized data processing will be used.

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## INTEGRATED SYSTEM OF DESIGNING, PREPARATION OF PRODUCTION

Minsk NARODNOYE KHOZYAYSTVO BELORUSSII in Russian No 1, Jan 86 pp 10-11

[Article by O. Kaminskiy and A. Sosnovskiy: "Overcoming the Difficulties"; first nine paragraphs are NARODNOYE KHOZYAYSTVO BELORUSSII introduction; capitalized passages published in boldface]

[Text] Automation: The New Stage

The idea of the thorough integrated automation of production finds its embodiment in the effective developments which are being introduced at enterprises of our republic. Many of them have already been told about on the pages of the journal. We are offering to the attention of readers the next thematic selection of materials.

The bulk of them cover the questions of the development of computer-aided design systems, and this is not by chance. Definite progress has now been achieved precisely in this area, which for a long time was not developed. As to the advanced know-how of the integration of all the components into a unified system and the organization of flexible machine systems, the account of it is ahead.

Here it is appropriate to cite the following statistic. Last year in Minsk 150 scientific research, design, and technical organizations and 14 higher educational institutions, within which 733 doctors of sciences and 8,890 candidates of sciences work, dealt with the solution of the problems of the automation and mechanization of production. This large detachment of skilled specialists helped production workers to assimilate advanced technology and advanced forms of the organization of labor.

However, the yield of science should be greater. It is necessary to overcome disunity and departmental isolation and to aim more at the end result. At many enterprises the introduction of robots and NC machine tools is lagging, an integrated approach to the use of means of automation and mechanization is lacking. All this is hindering advancement and the acceleration of scientific and technical progress.

In the following publications on the development of flexible machine systems we will devote more attention to the unsolved problems, without leaving aside, of course, advanced know-how.

We await interesting reports from the provinces, pointed messages, and profound analytical articles from our readers.

Complex engineering calculations, the choice of the optimum versions, the increase of the quality of designing, the elaboration of standard design and technological decisions, the organization of terminal stations of user-designers directly at the workplaces--the integrated system of designing and the preparation of production is called upon to solve these and many other problems.

O. Kaminskiy and A. Sosnovskiy, specialists in the field of the automation of designing, share their experience in the development and introduction of such a system.

The traditional methods of work of designers and process engineers today no longer satisfy the high demands on the quality and time of the assimilation of the production of new equipment under the conditions of the rapid interchangeability of items.

The segment of time from the origination of the need for a new item to its series production comes to approximately 3-4 years. The demand for an item, which has been subjected to the process of obsolescence, during such a period decreases significantly, while the expenditures on designing, the preparation of production, and manufacturing are not recovered. The losses of time are especially great at the stages of designing and the preparation of production. And this is given the fact that the capacity of production equipment in 5-7 years has increased by more than fivefold. Today the production of quite complicated parts requires minutes, while tens of hours are spent on the drawing up of design and technological documents by traditional methods. The problem is present, and one must not put off its solution to tomorrow.

The analysis of the activity of the design and technological subdivisions of our enterprise preceded the start of work on the automation of designing. As a result of this the greatest bottlenecks in the "designing--preparation of production--manufacturing" chain were identified. The process engineers and designers of the department of the chief process engineer (OGT) experienced the greatest difficulties when developing technological processes and control programs.

The developers of the computer-aided design systems also had to do work in these directions. The problem of determining the place of the specialists, who use the system, arose at the same time. It had to be decided: the process engineer either turns the assignment for designing over to the computer center or makes an online calculation himself on a computer. We settled on the latter. Now the question of installing displays for process engineers and furnishing them with all the necessary organizational methods documents should have been solved. Much was done to teach designers and process engineers the new specialty of operator. Other measures, which were



connected with the organization of the successful introduction of the developments being performed, were also implemented.

It should be noted that everything planned could have remained merely on paper, if it had not been for the understanding, with which the users of the computer-aided design system--the staff members of the department of the chief process engineer--treated automation. The role of the user in the integrated system of designing and the preparation of production was determined jointly with the developers. The performed work was not slow to yield its results.

In this connection it is possible to cite the following example. The development of an interactive subsystem of the computer-aided designing of technological processes on a YeS-1022 computer was completed 2 years ago. The storage of new technological processes in the computer archive took place during the first half year of operation. When the process engineers of the department of the chief process engineer obtained the opportunity to work at the displays, the result exceeded all expectations. Today with the aid of a video terminal the user of the system can search in the archive for an analog technological process, read it out onto the display screen, correct the analog, and obtain a new technological process. Whereas with the use of the traditional method of designing the process engineer developed in a day one technological process, today he can develop three or four. Now more than 90percent of the technological processes of machining, cold forging, and welding are developed with the aid of a computer.

We also want to note another positive aspect. Having mastered work at the computer and having appraised its possibilities, the process engineer began to participate creatively in the improvement of existing functional subsystems and the development of new ones, which ensure a decrease of the labor intensiveness and increase the quality of the design documents. Whereas previously years passed from the moment of the completion of the development of a new subsystem to its industrial introduction, now the same work is performed in a matter of months. This is connected to a greater extent with the fact that a collective of like-minded people from among the developers and users of the computer-aided design system began to be formed. The terminal for the process design engineer is today not simply a display instead of a desk or drawing table, but an optimally organized workplace, at which a person works more rapidly and with higher quality.

Of course, the extensive introduction of computer-aided design systems decreases significantly the amounts of manual designing, but does not eliminate it completely. The designing of technological processes, the simplest dies, control programs, and detailed drawings can already be carried out completely or in part given the present level of the development of the integrated system, while the problems of the designing of complex accessories, standardization, and development for technological feasibility with the use of computers will be solved in the subsequent versions of the system. The development of a computer-aided design system is a quite complex and labor-consuming process. It is significantly more difficult to teach a computer to design items than to play chess or to solve accounting problems. The production situation at the enterprise conceals such a large number of nonstandard situations, that it is impossible to provide for them.

An analysis of the functional subsystems of the computer-aided design system, which had been developed in our country and abroad, was made at the initial stage of the development of the system. Many of them had been borrowed, had been modified with allowance made for the specific nature of the enterprise, and had been introduced in production. The use of the experience of other organizations is one of the factors of the speeding up of the development of the integrated computer-aided design system. Such an approach is correct, and it is not necessary to carry on propaganda for it. However, it should be noted that, unfortunately, it has not been possible to achieve cardinal changes since the introduction of the borrowed systems. What is holding things back? First of all the information and program incompatibility, that is, the difference of the classification systems of the objects of designing and the different type of computer hardware and operating systems, among which the computer-aided design systems operate. Thus, during 1981-1983 we borrowed about 10 functional subsystems for the designing of accessories, technological processes, detail drawings, control programs, and so forth. The results of trial operation showed the impossibility of using more than half of them, while the rest proved to be suitable only for noninteracting operation, which reduced significantly the area of their application.

It is necessary to note the following aspect of the computer-aided design system. It is well known that the great skill and experience, which are acquired during many years of work at the enterprise, are inseparable concepts. As a result of the introduction of electronic computer hardware in the practical work of process engineers, this assumption no longer seems so indisputable. The computer ensures the finding of all possible versions (know-how) of the solution of problems and large volumes of standard technical information. Each user of the design system has access to these "storages," moreover, he receives the necessary information directly from the workplace. All this helps specialists to master more quickly the skills of the designing of technological processes, control programs....

Quite a lot has been and is being done for the purpose of developing a computer-aided design system at our enterprise. However, the first results also posed a number of difficult tasks on the assurance of the more efficient work of the users when operating the computer-aided design system. These are first of all the development of an extensive network of terminals, the carrying out of the standardization of structural components and accessories, the development of integrated and standard technological processes and a unified design and technological database, and so forth. The need arose for the issuing of a number of instructions and standards of the enterprise for the streamlining of the work on the automation of designing. Whereas at the initial stage the basic efforts of the developers were aimed at encompassing a larger number of engineering problems by computer-aided methods of designing, at present the principle of the integration of individual components in the unified "designing--preparation of production--manufacturing" cycle has become the main thing. New demands have been made on the set of hardware, that is, on the computer capacities which should serve the system. The local network based on minicomputers and microcomputers is called upon to support the work of the integrated system of the complete automation of production, of which the integrated system of designing and the preparation of production is a

component. The use of a network structure when forming the set of hardware makes it possible to meet most completely the requirements of real-time information processing.

Special attention in the system is being devoted to the preparation of control programs for the equipment which is a part of flexible machine systems.

The information link between engineering and the system of the computer-aided designing of control programs (SAP) consists in the fact that the drawing of a part, which was developed with the aid of a computer, after engineering is used for the preparation of a control program. This makes it possible to decrease significantly the amounts of input information. The implementation of the system in a unified set of hardware makes it possible, moreover, to avoid the transfer of the developed programs to intermediate media for subsequent transmission to NC machine tools. The use of graphic video terminals ensures the carrying out of the debugging of the control programs.

In the immediate future a quite high level of the automation of design and technological operations should be ensured. However, it should not be understood by this that the complete replacement of the human labor of designers, process engineers, and rate setters will occur and all design functions will be assigned to computers. The achievement of a 100-percent level of automation should signify the UNIVERSAL use of hardware for the solution of the problems of designing and the technological preparation of production. The increase of the efficiency and quality of designing, the improvement of the indicators of the objects being developed, and the shortening of the time of the preparation of production are the goal of the development and introduction of the computer-aided design system. This in the end should ensure the quick changeover to the output of new items and the extensive use of flexible machine systems.

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## PATENTS AND INVENTIONS

### DEVELOPMENT OF PATENT INFORMATION SYSTEMS

Institute, Enterprise Patent Services

Moscow NTR: PROBLEMY I RESHENIYA in Russian No 3, 4-17 Feb 86 pp 4-5

[Article by Ye. Temchin: "Patents Are the Compass of Progress. It Is Time to Demand. The Active Use of Patent Information Helps to Produce Products at the Level of the Best World Models"; first paragraph is NTR: PROBLEMY I RESHENIYA introduction]

[Text] The decisions of recent CPSU Central Committee plenums and party documents aim at the acceleration of scientific and technical progress. One of the conditions of this is the development and delivery to the works of fundamentally new highly efficient equipment. About 2 decades ago it was decided to establish a unified patent information center in our country in the system of the USSR State Committee for Inventions and Discoveries. At present the main depositories of the State Patent Information System have an enormous file of documents—more than 18 million descriptions of inventions which are in the world patent collection. It is sufficient for whoever wants to invent to make a request, and the patent experts of the enterprise or organization, at which the inventor works, having contacted information centers, will quickly obtain everything necessary. But, as practical experience shows, far from everywhere do the developers of equipment begin with the study of the achieved world level. As a result the machines being designed by the time of their production are already becoming obsolete. The need for the qualitative improvement of the use of patent information is on the agenda.

Several months ago I happened to be in the Collegium of the State Committee for Inventions and Discoveries, where the state of affairs with inventing, patent, and license work at the All-Union Academy of Agricultural Sciences imeni V.I. Lenin was being examined. By the way, this was the third collegium in the past 10 years, which was devoted to the same problem. They convened for the first time in 1974 and the second time in 1978. The main speaker noted: since the last collegium was convened, changes for the better had occurred at the academy. He, in particular, praised several scientific production associations, at which the number of inventions had increased and at which the patent services are operating more or less decently....



In the system of the All-Union Academy of Agricultural Sciences imeni V.I. Lenin there are 130 institutes. There are full-fledged patent departments at only nine of them. And, as the analysis showed, these institutes also provide mainly new products. But what do the others provide?...

At one of them in accordance with the plan of research and development they designed a device for cotton ginning. They worked for several years. They completed the work and decided that an invention had been created, and turned to the State Committee for Inventions and Discoveries. And they received a rejection on each point of the application. The appraisal determined: all the "innovations," starting with 1929, had already been registered. The last inventor's certificate was issued 6 years ago.

And at another institute the situation is the same: they developed as if new equipment, spent 500,000 rubles, but did not submit either an invention or even an application. Perhaps, they had not intended to invent anything....

That is just the point, that it is possible, it turns out, to live without cares, existing at the side of scientific and technical progress, and to receive in so doing bonuses for developments which do not contain inventions. Because to this day there are still no reliable criteria of the novelty of equipment.

What equipment is to be considered new? That equipment, the characteristics of which are better than what was produced previously? But such equipment is new only as compared with the old equipment. Practical experience shows: novelty exists wherever there are fundamentally new technical solutions, that is, there are inventions.

In our times the obsolescence of novelties being developed comes surprisingly quickly. In 3-5 years--and there is the next model. They have hardly begun to produce it, and the designer is already preparing the design of a new model. How is one to keep up here? It is possible to keep up, if one does not wait until the latest technical solutions are used in industry, but works with the patent information which appears immediately, as soon as an invention is registered.

How do they still work at many design bureaus? Before the start of designing the designers study models of the domestic and imported product, then set to work on developing their own models, compiling what has already been assimilated by others. But several years usually pass from the origination of an idea to the organization of production. During the time that the development has been entering production, new, more advanced ideas have appeared. Therefore, whoever has patent information and knows how to use it, is at the very spearhead of scientific and technical progress.

I have already had occasion to write about the Tallinn Production Association of Electronic Equipment--RET. This collective in a short time was able to update substantially the output being produced. Now that it has become competitive on the world market, it is strange to recall that several years ago everything was different. The equipment coming from the shops of the association in many cases was obsolete and did not correspond to the world

level which had been achieved in this area. It was then that they decided at the Tallinn Production Association of Electronic Equipment that it was necessary to radically reorganize the work. How? The designers themselves found the solution: to design new equipment not in accordance with models and catalogs, but in accordance with patents and inventor's certificates.

They established a patent research department. Its staff members began to supply the developers with information on the latest technical solutions, let me emphasize, on solutions, and not on finished items which had appeared in our country and abroad. A strict procedure was established: the technical assignment for designing is drawn up only after the patent experts have ascertained what new solutions on the given theme exist in world practice.

The first results of the work in the new way proved to be very reassuring. In only 3 years it was possible to develop several tens of instruments which were not inferior to the best world models. All of them contained inventions.

The picture at the Leningradskiy metallicheskiy zavod Production Association of Turbine Building (LMZ) is similar. Here, too, the designers do not repeat what has been covered, they work in accordance with patents. The developers of new equipment, who receive without delay this type of information from their patent service, are well informed of what is happening in the world in the area of turbine building.

It is an axiom: in order to invent something new, it is necessary to know what was already invented before you. A unique system—the GSPI—the State Patent Information System, into the depositories of which practically all the information needed by inventors flows, operates in our country. It is possible to imagine the State Patent Information System as a cone, at the top of which are the main depositories of patent information—these are the All-Union Patent Technical Library (VPTB) and the Poisk Scientific Production Association. On the section of the cone there are also depositories, but ones which are a little smaller. They have been established in nearly every region of the country, as well as in sectors. The goal is to bring closer to the user the files of information, having concentrated it "by interests." And, finally, at the base are the users of the information, those who develop new equipment: scientific research institutes, design bureaus, and enterprises. Here they also make up their own patent collections.

The State Patent Information System cost the state millions of rubles. Elaborate computer hardware complexes operate here. Every month newer and newer reels of magnetic tapes with reports on the latest inventions that have been developed throughout the world go from the Poisk Scientific Production Association to ministries and departments in various regions of the country. Previously many months were spent on such work. In order to speed up more the transmission of information, the brain center of the system—the Poisk Scientific Production Association—developed a mechanism which makes it possible in literally a few minutes to obtain all the information that interests the developers of new equipment. The problem of remote access to the data banks has practically been solved. Without spending time on all kinds of correspondence, it is possible, having tied into the remote access

channel to the depositories of information, to read on the display screen everything you need.

But here the question is, is the State Patent Information System being used efficiently? Do we have enough skilled services which are capable of working with the State Patent Information System at a professional level?

After my business trips to the Tallinn Production Association of Electronic Equipment and the Leningradskiy metallicheskiy zavod Production Association I became interested in finding out at the State Committee for Inventions and Discoveries, where else the matter with patent and license work had been organized no worse than at these associations. They named for me the same enterprises and institutes (10-15, no more), about which they often write in the newspapers and radio and television tell. They cite them as an example for others, since these enterprises and institutes produce truly new, competitive equipment. But others should also produce it!

The spot check made by the State Committee for Inventions and Discoveries showed: 28 percent of the scientific research institutes and 58 percent of the industrial enterprises have patent services which consist of 1 person; more than a fourth of the checked enterprises do not conducted patent research at all. How do designers act in such cases, being left in essence one on one with their development?

"We go to the scientific and technical library, select materials on the theme of interest, and look through them. We have our own small patent collection, we also look at it. But then comes ordinary work: we think, we organize experiments. If we obtain any interesting, new results, we write applications for inventions...."

So related Candidate of Technical Sciences Anatoliy Alekseyevich Malygin, an instructor of the Leningrad Technological Institute. At their faculty there are 5 chairs--300 people and...1 patent worker. Judging from the references, he is a conscientious person who understands his job. But what can he do?

"We have tens of themes, tens of directions of work, is one person really capable of conducting patent research on each of these directions?" Malygin continued. "What kind of help does he give? Sometimes he will give advice on how to draw up an application correctly, sometimes he will go with one of us to the library and help to find the necessary information...."

"Do you use the services of the State Patent Information System?"

"Use what?"

"There is such a system of assistance to inventors. An affiliate of the Poisk Scientific Production Association, the SAPFIRI [System for the Automated Development of Collections and the Selective Dissemination of Information], operates here in Leningrad. It is able to make up patent collections and to give out only the information which is needed. The SAPFIRI does this very quickly."



"Yes, I have heard of it. But we do not use this system. It is also possible to invent without its assistance."

"It is possible, it is," I objected, "and the efficiency is not what is wanted."

"But you know," Malygin agreed in the end, "it has become more difficult. Previously, when no one worked in our field, all inventions were ours, but now it is a different situation. It is necessary to make the search more carefully, we are spending more time on this. We grudge, of course, this time."

A.A. Malygin is a serious inventor. He has several tens of developments which are yielding a real economic impact. And his "Use what?" in response to my question about the State Patent Information System does not mean, of course, that Anatoliy Alekseyevich in practice also learned about it only from me. The point is that the State Patent Information Service, unfortunately, so far "does not have the ear" of inventors. No matter how paradoxical, the developers of new equipment take little interest in the scientific and technical achievements in the area of the acquisition and retrieval of patent information. Although with the aid of automated systems it is possible to obtain the information of interest tens of fold more rapidly.

I have more than once had occasion to hear discussions about the inadequate efficiency of the State Patent Information System and about the fact that it is now yet known how advisable its organization, which costs quite a lot, is, while the economic impact from it has not been calculated, and it will hardly be possible to calculate it. True, how would you determine whether the profit from such a nonphysical product as information is large? But still it is possible to calculate something. For example, the losses, because we are using poorly the services of the State Patent Information System.

Invention in our country is a mass type of creativity. Annually about 200,000 applications are received for consideration by the expert commission and the expert commission rejects approximately half of them. Why? In general there are two reasons: either the applications (and these are a legal document, special demands are made on it) have been drawn up unskillfully or the technical solution proposed in the application has already been registered and, consequently, they have invented what has been invented. Whereas in the former case patent illiteracy is to blame, in the latter the inability to use information or the lack of conscientiousness is. Meanwhile the examination of a patent costs the state 55 rubles. This means that it annually loses over 5 million rubles. It should be added that 90 percent of the applications are received from people who are working in accordance with plans of research and development. That is, from the most "organized" inventors who work in scientific research institutes and design bureaus and at industrial enterprises.

The inventors of the Tallinn Production Association of Electronic Equipment told me that they do not have conflicts with the expert commission and the refusals to issue inventor's certificates are extremely rare. It is the same at the Leningradskiy metallicheskiy zavod Production Association. The secret



is simple. First, the developers themselves have patent knowledge, second, patent experts, who provide the designers with all the necessary information and are capable of evaluating the technical level of a design and of giving the necessary advice, which is connected with priority matters, work nearby.

But patent information, if it is approached skillfully, can also yield more. By analyzing it, it is possible to forecast invention and to suggest to engineers, where inventing thought is moving, in what directions a creative search should be made, and where it is unpromising to search.

In the words of the general director of the Tallinn Production Association of Electronic Equipment, patent and license work, which has been organized well and in a skillful manner, not only is very conducive to the designing and production of new equipment, but also elaborates means of the protection of the priority of the state to the innovations being developed in our country. The trouble is that far from everyone understands the importance of this.

At one time Professor V.B. Aleskovskiy, now rector of Leningrad State University, was in charge of the chair at which A.A. Malygin, with whom we are already acquainted, works. He developed a new direction in chemical science—chemical assembly or, as it is sometimes call, chemical designing. I will briefly explain what this is. All chemistry is based on the principles of the mixing of some substances with others and the obtaining of third substances which have new properties. Although these processes are controllable, the control itself is very relative. Science has derived specific laws, within which the mixing occurs and the anticipated results are obtained.

The method of Professor Aleskovskiy makes it possible to control the movement of particles of matter very precisely, obtaining from these particles the desired structures.

I visited the chair for the first time several years ago and was astonished by what I saw. They showed me blood vessels, which had been obtained by the new method, and a dog, which lives well with these vessels. They displayed pieces of pipes and metal plates, other intricate items, which had been obtained by the new method under laboratory conditions. I wrote at that time about all this in one popular science journal and since then have maintained constant contact with the chair.

Thus, several years have passed since my first visit to the chair, several technologies have already entered industry, their authors have received tens of certificates for the inventions developed by them and hope to receive a large number more of them. Now this method has acquired a large number of successors in laboratories of the world, for no new direction in science enjoys the exclusive priority of its authors for a long time. Whereas in former years at the very start of the work its initiators were the only ones, now the picture has changed, a wave of foreign patents has started. They could have been our domestic ones, protecting the priority of our country. But these matters should be dealt with in earnest and by no means by the developers of the new direction. Scientists do not know all the fine points which are connected with the patenting of inventions abroad and with the

conclusion of license agreements--this is not at all their job. This is the work of the patent and license departments.

At the chair they were quite sincerely bewildered: Who will allow such a luxury--a patent service? And, probably, actually hardly anyone will. But the general director of the Tallinn Production Association of Electronic Equipment went to the minister specially in order to request permission to establish a patent department and in addition a service for the rapid introduction of inventions, having demonstrated how useful all this is. And the minister helped. The result is that the Tallinn Production Association of Electronic Equipment caught up with and in some things overtook the foreign firms which are considered the arbiters in the production of advanced electronic equipment.

The acceleration of scientific and technical progress is inconceivable without well organized and controlled invention which constantly gives momentum to this acceleration. The entire history of scientific and technical progress is the history of large and small inventions. For the present few people understand this. Yes, it is necessary to be a strategist, to see the future, in order in daily production concerns to perceive the importance of patent work, and to understand that it is necessary to engage in it not in an amateurish manner, but in a professional manner, and that this is one of the levers, by means of which it is possible to manage scientific and technical progress.

#### Description of SAPPFIRI

Moscow NTR: PROBLEMY I RESHENIYA in Russian No 3, 4-17 Feb 86 pp 4-5

[Article by G. Nikolayeva: "'Information Onto the Desk' Is the Principle of the Operation of SAPPFIRI. New Automated Systems Are Increasing the Efficiency of Patent Information Service"]

[Text] The possibility of the selective distribution of information on magnetic tapes made it possible to develop a fundamentally new technology--"information onto the desk." The automated system of the selective dissemination of bibliographic information and the management of the making up of patent collections--SAPPFIRI--which operates at the base of the Leningrad Affiliate of the Patent Production and Printing Enterprise, implements it.

When a theme is still at the initial stage of elaboration, it, as a rule, is understood very broadly. And only after the making of a search in the retrospective collection, having studied the first patent documents, will the developer be able, taking into account the conditions of the posed task and the technological limitations, which exist at the given enterprise, to make his request more specific and to submit it for service to the system of the selective distribution of information. The system remembers the request, selects the necessary information, and delivers it to the user. Thus, the developer does not need to go through heaps of publications. The system guarantees that it will issue all the information of interest to the user with the maximum accuracy and completeness.

The SAPPFIRI can conduct a search with respect to any element of the bibliographic description and any combination of these elements. For example, with respect to key words from the titles of descriptions of inventions, with respect to the international and national classification of inventions, and with respect to names of firms. Even if affiliates of the firm are located in several countries, the system guarantees that it will find and issue to the user all its documents.

The system now has more than 350 users. Among them are the academies of sciences of the union republics, ministries, and large industrial enterprises, including, for example, the ZIL Production Association. During the year the association used the services of the SAPPFIRI. It is possible to judge from the information, which was received by the Poisk Scientific Production Association, how useful the received information was and how efficiently it was used.

Here are several examples. During the modernization of the unwinding device of roll material elements of the design were developed on the basis of an American patent of the Aida firm. After the analysis of the patents of the Schuller firm the question of the advisability of purchasing the unit for the cutting of the roll steel of this firm was settled. The 19 documents were issued by the system in response to the request "Centering Screw-Down Devices for Machine Tools." Making a start from the achieved level, at the association they developed their own devices. Their prototypes are being readied for tests under laboratory conditions.

In accordance with the responses of the users, the SAPPFIRI is giving much assistance to the developers of new equipment, although far from all the potentials incorporated in the system are being used. The Poisk Scientific Production Association is continuing the work on its improvement.

Telecommunication access to the centralized data banks is affording new possibilities. The system of remote access has already gone into operation. The user, who is at any point in the Soviet Union, can link up with the Poisk Scientific Production Association, in a matter of minutes make a search in the retrospective collection, and find out which documents of interest to him are available and how it is possible to obtain them. The appropriate equipment is required in order to use remote access.

At present access is possible through the PD-200 data transmission network with the use of a TAP-34 terminal.

The possibility of access to the databases of the Poisk Scientific Production Association already exists in 52 cities of the country. There are now two of them: the base of patent analogs and the first stage of the retrospective database of patent information. The latter includes for the present 2.5million documents. With the aid of the original solutions, which were found at the association, soon it will be possible to expand the database significantly and to simplify online access to it, using in so doing the minimum computer resources. By the end of this year the number of documents contained in the data bank will have already doubled, access to them will have become broader.



This retrospective base is completely compatible with the SAPFIRI with respect to the retrieval language. Together they constitute an integrated information reference system. Having turned to it, the user can obtain not only a secondary description of documents. The system will remember the requirements for their complete description and will guarantee their issuing. Here, as practical experience shows, even quite complicated requests will be filled in 20 minutes.

#### Patent Work at LMZ Association

Moscow NTR: PROBLEMY I RESHENIYA in Russian No 3, 4-17 Feb 86 p 5

[Interview with G.V. Chuzhin, chief of the patent and license department and deputy chief engineer of the Leningradskiy metallicheskiy zavod Production Association, by G. Sidorov: "The Assistant of the Designer"; date, place, and occasion not given; first two paragraphs are NTR: PROBLEMY I RESHENIYA introduction]

[Text] At the Leningradskiy metallicheskiy zavod Production Association patent work has become an integral component of designing. The usefulness of the patent department does not arouse anyone's doubts.

The association exports about 30 percent of its products to 26 countries of the world. This means that the turbines of the Leningradskiy metallicheskiy zavod Production Association with respect to many of their characteristics not only are not inferior to the best world examples, but also surpass them. We are speaking with G.V. Chuzhin, chief of the patent and license department and deputy chief engineer of the Leningradskiy metallicheskiy zavod Production Association, about what role patent work plays in the assurance of the competitive ability of developments.

[Question] What importance is being attached to patent work at the Leningradskiy metallicheskiy zavod Production Association?

[Answer] Since 1977 the following procedure has been in effect at our association: without the conducting of preplanning patent research no development, of which the association itself is the initiator, is included even in the draft of the thematic plan.

The goal of patent research is to ensure the high technical level and competitive ability of the objects of equipment, which are being developed, and to evaluate their novelty. Therefore, we believe: the patent expert should work together with the developer, helping him to develop equipment at the level of inventions.

[Question] How are the interrelations of the design and patent expert organized?

[Answer] The developer himself is the basic performer of patent research. We take upon ourselves the procedural and organizational work and provide the designer with information. With our assistance the developer should clearly

picture what the latest achievements in the world practice of turbine building are, what the trends of the development of the sector are, and in what directions a creative search should be made.

By development we understand the creation of a new thing. And along with the evaluation of the technical level the evaluation of the novelty of a development is one of the goals of the conducting of patent research. Three categories of the payment of bonuses have been established at the association subject to this.

The highest is if the development has been executed at the level of an invention or a previously developed domestic invention has been used in it for the first time. Here the technical level of the development should exceed or correspond to the level of the best domestic and foreign analogs.

The average is if the technical level of the development corresponds to the level of the best domestic and foreign analogs, but in this case new inventions have not been developed and the first use of previously developed ones has not been accomplished.

The lowest is if the technical level of the development is inferior to the best domestic and foreign analogs.

I will note that the patent and license department determines the categories of the payment of bonuses (and accordingly the economic stimulation fund). And this forces the developer to treat patent research in a completely different way than, say, was previously the case.

[Question] You are constantly orienting the designers of the association toward the world level, and this cannot but affect the question of the developments being devised by them. It is becoming the norm to design equipment at the level of inventions.

[Answer] We must not work otherwise. The guaranteed life of the turbines being produced by the Leningradskiy metallicheskiy zavod Production Association is 30 years. Therefore, during designing we should incorporate in them the latest, most advanced achievements of technical thought.

It is customary to believe: the number of submitted applications determines the effectiveness of inventing work.

In our opinion, this is not so. At our association we analyze the anticipated total impact from the inventions which are at the stage of applications. Thus, for example, during the 11th Five-Year Plan the number of applications remained practically the same as during the 10th Five-Year Plan, but the anticipated economic impact increased by threefold. This once again testifies that the level of technical solutions has increased.

## Editorial Note

Moscow NTR: PROBLEMY I RESHENIYA in Russian No 3, 4-17 Feb 86 p 5

[Article: "From the Editorial Board"]

[Text] A special meeting of the Collegium of the State Committee for Inventions and Discoveries, at which the draft of the program of the development of the State Patent Information System during the 12th Five-Year Plan was examined, was held recently.

According to the draft, in particular, it is proposed:

--to ensure the possibility of automated thematic retrieval in accordance with the international classification of inventions in combination with other bibliographic data (surnames, names of firms, dates), as well as with key words from the title of a document or its abstract;

--by the end of the 12th Five-Year Plan to encompass by databases up to 15million bibliographic descriptions and several hundred thousand abstracts. In combination with other measures this will make it possible to decrease to one-fifth the time and labor intensiveness of the patent search;

--by means of the improvement of the technology of storage, the selection of documents, the gathering and processing of consolidated orders, which are transmitted via communications channels, the monitoring of their passage, as well as the introduction of an advanced technology of the keeping of the film files of the Poisk Scientific Production Association on microfiches, to shorten to one-fourth the time of the production of copies of descriptions of inventions;

--to give assistance to sectorial and territorial scientific and technical information organs in the development and use for the patent search automated databases, to develop and turn over standard designs, software, and the corresponding procedural recommendations for the improvement of patent information activity;

--to make a comprehensive analysis of the needs for patent information and to specify on the basis of its results the types of information and information services of the Poisk Scientific Production Association, as well as to improve the structure and composition of the network of territorial patent collections and the principles of the interaction of the Poisk Scientific Production Association with central, sectorial, and regional scientific and technical information organs;

--to create a film file of all the abstracts and descriptions of inventions, which have been published since 1963 by the All-Union Scientific Research Institute of Patent Information, and to provide with blocks of abstracts on microcarriers, which have been systematized in accordance with the international classification of inventions, all the interested territorial patent collections, organizations, and enterprises.

As we see, the information possibilities of the State Patent Information System will increase substantially. But the accumulation of resources is not an end in itself. These resources are the means, by which the high level of developments should be ensured.

What is it necessary to do so that patent information would become even more accessible? How is the interest of everyone, who is developing new equipment, in obtaining it to be increased?

The editorial board invites both the developers of new equipment and technology and those, who should provide them with patent documents, to take part in the discussion of this theme.

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CSO: 1814/213



#### BRIEF

X-RAY DIAGNOSIS DEVICE FOR CRYSTALS--The staff members of the sectorial laboratory of X-ray research of Yerevan State University under the supervision of Professor P. Bezirganyan are studying the problems connected with the development of advanced and high-speed X-ray devices. The device developed here makes it possible to see an X-ray diffraction structural picture of the crystals being studied directly on a television screen and to trace the dynamics of displacements along the crystal and the interaction. In its speed the device surpasses similar ones which use low-power sources of X-radiation. The system of visualization, which was developed by Armenian scientists jointly with students of the upper classes, can be used in laser and semiconductor engineering, optoelectronics, and so on. Several devices, which were made in the laboratory of the higher educational institution, have been sent to various organizations. [By R. Mosyan] [Text] [Yerevan KOMMUNIST in Russian 18 Apr 86 p 4] 7807

CSO: 1814/217

## INTERNATIONAL S&T RELATIONS

### PRIORITIES OF CEMA SCIENTIFIC, TECHNICAL PROGRESS

Moscow EKONOMICHESKAYA GAZETA in Russian No 17, Apr 86 p 20

[Article by Candidate of Economic Sciences B. Medvedev, expert of the International Institute of Economic Problems of the World Socialist System, under the rubric "Socialist Integration in Action": "The Priorities of Science and Technology"]

[Text] "Socialism," it was noted in the Policy Report of the CPSU Central Committee to the 27th party congress, "has everything necessary in order to place modern science and technology at the service of people. But it would be incorrect to assume that the scientific and technical revolution is not posing problems for socialist society as well." The solution of such problems in the countries of the socialist community in many respects will depend on the implementation of the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000, which was adopted in 1985.

Not only the creation of theoretical reserves for the acceleration of scientific and technical progress, but also the embodiment of basic scientific ideas in specific advanced technologies, new generations of highly efficient machines, and fundamentally new materials are envisaged in each of the five priority directions of the program. The opportunity to shorten drastically the path from the origination of an scientific idea to its extensive use in practice, as well as to eliminate the duplication of scientific research and the work on its introduction, which in itself will make it possible to save in the CEMA countries 5-7 billion rubles a year, has appeared.

The socialist community has the necessary material and organizational prerequisites for the success accomplishment of the tasks of the Comprehensive Program of Scientific and Technical Progress. The CEMA countries have already developed on a joint basis nearly 2,000 new designs of machines, devices, and instruments, about 1,400 technological processes, and more than 1,5000 types of new materials, products, and compounds.

The combining of forces on a bilateral basis is also yielding a large impact. For example, the USSR and the GDR have developed advanced technologies of the production of high-pressure polyethylene; electric locomotives which develop a speed of up to 200 kilometers an hour; a beet harvester, the output of which has been increased as compared with the existing models by more than

twofold. The fruitful cooperation between the Leningrad Elektrosila Association and the Hungarian Ganz Electric Works made it possible to ensure an increase of the technical level of large turbogenerators and to increase their rating from 50 to 220 megawatts.

The necessary organizational steps on the closer coordination of scientific, technical, and production cooperation and on the increase of the effectiveness of its influence on the intensification of social production are being taken within CEMA. In particular, more than 120 councils of representatives, 65 coordinating centers of scientific and technical cooperation, 3 international institutes, and more than 10 international collectives of scientists, joint laboratories, and design bureaus have been established.

These and other steps are contributing to the utmost to the increase of the return of the scientific and technical cooperation of the fraternal countries in each of the priority directions of the Comprehensive Plan of Scientific and Technical Progress.

#### The Introduction of Electronics in the National Economy

The collective solution of the problem of the mass introduction in the national economy of the CEMA countries of microelectronics, first of all highly efficient computer and telecommunications equipment, is envisaged in this direction. This will make it possible to increase radically labor productivity and product quality, to ensure the saving of all types of resources, and to improve the daily life of the population and its information supply.

The use of computers in computer-aided design systems and plant technical management automation systems is already now making it possible to increase by seven- to tenfold their productivity and to decrease by several tens of fold the consumption of power.

The social function of the introduction of electronics--the facilitation of the labor of man and the increase of its meaningfulness and creative content--is also no less important.

The multilateral division of labor in the area of the strengthening of the material base of the introduction of electronics is being developed. Thus, within the framework of the corresponding agreement Bulgaria and the USSR are specializing in the production of computer-aided design systems, Hungary--in the output of measuring and testing equipment, the GDR--optical mechanical equipment, Poland--equipment for the assembly of integrated microcircuits, Romania--in the manufacture of semiconductor materials, the USSR--in the production of structures of large and very large integrated microcircuits, the CSSR and the GDR--in the output of research equipment and instrumentation.

The further development of the introduction of electronics in the national economy by the CEMA countries envisages the uniting of efforts in the development of supercomputers with a speed of more than 10 billion operations a second, a unified system of the transmission of digital information, high-speed fiber optic means of communications, a new generation of satellite

communications and television broadcasting systems, as well as high-quality digital television and stereo radio broadcasting and digital video and sound recording equipment.

### Integrated Automation

This direction of the Comprehensive Program of Scientific and Technical Progress includes the production and introduction in the national economy of flexible machine systems and the development of automated shops and plants, computer-aided design and control systems, robots, instruments, and automation equipment, rotary conveyor lines, and equipment and measuring devices for precision machine building.

The use of flexible machine systems makes it possible to increase labor productivity by 1.5- to 4-fold, to increase the utilization of equipment by 30percent, and decrease the specific expenditures on production by 15percent. Under the conditions of the present dynamic development of the national economy of the CEMA countries the capacity of flexible machine systems for quick changeover and the progressive updating of the assortment, which makes it possible to shorten the time for the preparation of the output of new items by approximately 40 percent, is no less important.

The great effectiveness of integrated automation is witnessed in many CEMA countries. For example, in Hungary the total economic impact from the introduction of the results of a number of joint scientific research efforts on the automation of power engineering, the production of refractories, and environmental protection comes to more than 150 million florinths a year. The impact from the introduction in the USSR of automated control systems in milling has already exceeded 2.6 million rubles.

The development of means of integrated automation will have a revolutionizing influence on many sectors of production and will lead to the substantial intensification of their functioning.

### Atomic Energy

According to the available estimates, during the coming decade the total capacity of the nuclear electric power plants of the CEMA countries will increase to 100 million kilowatts. If it is considered that every 1 million kilowatts will make it possible to save annually more than 2 million tons of standard fuel, its total saving will exceed 200 million tons a year.

The international specialization and cooperation of the production of the equipment necessary for this are contributing to the rapid development of atomic energy. In conformity with the agreement, which has been concluded in this area, Bulgaria is producing transportation and technological equipment, means of biological protection, special pumps, and fittings; Hungary--special water treatment equipment, transfer machines, special machine tools for the repair of the first vessel, and several types of electrical items; the GDR--overhead cranes, transportation and technological equipment, and special bellows fittings; Poland--pressurizers, heat exchangers, and systems of radiation and internal reactor monitoring; Romania--the main circulating



pumps, water tanks for the emergency cooling of the reactor core, overhead cranes with a lifting capacity of 320 tons, overhead cranes of the turbine room, and instrument transformers of high voltage equipment. The Soviet Union is producing practically all the equipment for nuclear electric power plants with reactor units like the VVER, the CSSR--a significant portion of the technological equipment for power-generating units with a capacity of 440 megawatts, including complete reactor units.

#### New Materials and Technologies

The development and assimilation of new materials, as well as the technologies of their production and working are one of the most promising directions of scientific and technical progress. It makes it possible to increase drastically the level of production and the reliability and durability of the tools of labor being developed and to decrease the consumption of various resources. Experience in the achievement of such results at a number of works with the use of powder metallurgy, structural plastics, and other materials has already been gained in the CEMA countries.

Important results were obtained, for example, during the joint elaboration of the problem of obtaining new plastics and synthetic resins. The development in this area on the basis of complete mechanization and automation of more advanced processes in the processing of plastics made it possible to increase significantly the quality of the items being produced and to increase labor productivity by 1.5- to 2-fold. The use of high-strength, corrosion-resistant, and refractory materials, technological lasers for welding and heat treatment, plasma, vacuum, and detonation technologies, impulse excitations, and explosion energy for the synthesis of superhard materials is yielding a large impact.

#### Biotechnology

The development of biotechnology, just as of the other priority directions of scientific and technical progress, is of not only enormous economic, but also social importance. The fusion of the most advanced technical thought with biology is capable of ensuring a genuine breakthrough in the development of means of the effective prevention and treatment of serious diseases and the increase of the reserves of foodstuffs, and as a whole of raising health care and agriculture to a new, qualitatively higher level. Biotechnology can make an important contribution to the matter of environmental protection, in which new methods of the recovery of industrial, urban, and agricultural waste and the use of sewage and gas-air emissions for the obtaining of high-quality fertilizers and biogas are being developed with its aid.

The fulfillment of the Comprehensive Program of Scientific and Technical Progress was begun already during the 41st (extraordinary) meeting of the CEMA session, which adopted it. The signing of the General Agreement on Multilateral Cooperation in the Development and Introduction of Computer-Aided Design Systems (SAPR), the General Agreement on Multilateral Cooperation in the Development, Production, and Use of the Unified System of Light Guide Data Transmission Aids, and the Agreement on the Establishment of the Interrobot

International Scientific Production Association was the first step in this direction.

The joint implementation of the Comprehensive Program of Scientific and Technical Progress is not only a most important economic, but also political task. It will make it possible to strengthen the positions of socialism on the international arena, to take a new step forward on the path of peaceful competition with capitalism, and to demonstrate once again the historical advantages of the planned management of the economy.

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## SOCIO-POLITICAL FACTORS

### CPSU STRATEGY IN SCIENTIFIC, TECHNICAL, SOCIOECONOMIC PROGRESS

Kiev POD ZNAMENEM LENINIZMA in Russian No 3, Mar 86 pp 43-50

[Article by Vice President of the Ukrainian SSR Academy of Sciences Academician I. Lukinov under the rubric "By the Path of Acceleration": "The Strategy of Development"; capitalized passages published in boldface]

[Text] The formulation and implementation of the strategic line of party policy are a complex and multilevel process. It is based on the results of the latest scientific achievements and the generalization of the enormous experience, which has been gained by our country and the entire world system of socialism.

On the basis of objective laws and the precise consideration of positive and negative trends, the CPSU formulated for the coming 15-year period such a policy which encompasses all aspects of its diverse activity in modern society.

It is possible to manage it skillfully at the present stage, which requires the substantial acceleration of the pace of scientific and technical, socioeconomic, and spiritual progress, only on a strictly scientific basis. This means that it is necessary to know how to relate any strategic and technical decision to the real needs of life and the objective laws and trends of social development. The choice, making, and implementation of one specific decision or another and the putting into effect of tactical actions require comprehensive substantiations and well thought out and weighed determinations of their consequences in accordance with the criteria of real efficiency for society and the economy.

The CPSU is trying persistently to see to it that all its organs and primary organizations would use skillfully the methods of the scientific approach to the matter. The drafts of the new version of the CPSU Program, the changes of the Party By-Laws, and the Basic Directions of USSR Economic and Social Development for 1986-1990 and the Period to 2000 specify the strategy and tactics of socialist development and embody the latest theoretical views on the problems of present and future progress.

The draft of the new version of the third CPSU Program contains a thorough and comprehensive analysis of the present age and reveals the basic laws and

trends of all world development. The question of continuity in the development of theory and the program directives of the party is, as General Secretary of the CPSU Central Committee Comrade M.S. Gorbachev emphasized in the report at the October (1985) CPSU Central Committee Plenum, is the question of its adherence to theoretical principles and consistency, its loyalty to Marxism-Leninism. By its most responsible attitude toward Marxist-Leninist theory and strategic concepts the party is systematically strengthening its great authority, which it has gained in the international communist movement and in the midst of the progressive world community.

At the same time consistency and continuity presume the critical review and specification of some principles and precepts or others, which have ceased to correspond to real life or did not have the proper economic and political substantiation. The CPSU Central Committee approached from precisely this standpoint the reinterpretation and revision of a number of provisions of the former version of the party Program, without allowing any manifestations of negativism with respect to the main thing—its ideological and theoretical content. The draft of the new version has been enriched by fundamentally new theoretical conclusions and evaluations in connection with the changed situation in the world and the development of Soviet society. All this conforms to the revolutionary spirit and theoretical method of Marxist-Leninist doctrine.

The CPSU links its guiding function in society with the continuous improvement of the forms and methods of management. A period, when the mechanism of the management and control of social and economic processes, which was previously developed and operated efficiently for its time, becomes obsolete and comes into conflict with the new requirements of life, inevitably comes in the process of the functioning of the socialist system. Basic scientific research and development, which ensure the real acceleration of progress, are especially important here.

The present stage in the development of socialist society is being accompanied by the further socialization of production and by its intensification on the basis of the acceleration of scientific and technical progress and changes in the content of the system of organizational and economic relations. The improvement of the structure and functioning of the unified national economic complex of the country is occurring. All this is also causing the need for a qualitatively new approach to the very policy of party and economic management. Here the extensive assimilation of the latest achievements of modern science and advanced know-how and the use of more flexible and effective methods of economic management in fundamental and optimal interconnection with administrative methods are acquiring particular importance.

V.I. Lenin conceived the scientific approach to the supervision and management of society first of all as a systems, integral approach. It follows from the very essence of Marxist-Leninist theory of social development, the basis of which is the doctrine of the socioeconomic formation as a complex social organism, all the components of which most closely interact and are coordinated and subordinate. The modeling and optimization of the system, which manages such an organism, constitute the foundation of the unity of the



national economic and economic, sectorial and territorial levels of management.

Under the conditions of socialism the public ownership of the means of production unites and rallies people and makes it possible to mobilize the entire resource potential--its manpower, material, and financial resources--for the solution of the priority problems of the building of communism. Relying on the objective laws of social development and the present achievements of science, the CPSU Central Committee and the Soviet Government have advanced strategic concepts and are conducting large-scale economic experiments on the development of a new, more advanced mechanism of social management. Socialism, having a distinct system of specific economic supervision, is extending the boundaries of management to the scale of all of society, uniting its production, sociopolitical, and ideological spheres into a fundamental integrity.

The CPSU is carrying out the scientific supervision of social processes in society on the basis of the use of objective laws in the interests of the utmost acceleration of the development and improvement of socialism. The implementation of the principle of the objectivity of such supervision presumes: first, a knowledge of the general and specific laws of the emergence, functioning, and development of the communist formation; second, the consideration of the peculiarities of their interaction in the economic, sociopolitical, and spiritual spheres; third, the use of the mechanism of the effect of objective laws in conformity with the nature of social relations.

The more and more complete meeting of the constantly increasing needs of the members of socialist society by the systematic development and improvement of production, its intensification, and structural and qualitative changes in conformity with the objectively changing needs and demand acts as the goal of the basic economic law of socialism. The problem of the balanced development of the economy--the resources being committed to the economic turnover, the volumes, structure, and quality of the products being produced and services with the real and diverse demands of consumers--is one of the priority problems and is being solved in a planned manner on the basis of the elaboration of intersectorial balances.

In the process of improving socialist society the increase of the guiding role of the party is occurring. The CPSU is determining to a greater and greater extent all aspects of social life, ensuring the dialectical unity of economics and politics, the increase of the level of the supervision of the collective activity of workers, and the active influencing of the development of productive forces and production relations. The guiding role of the party appears especially clearly in the increasing soundness of its socioeconomic policy and the level of supervision of social processes at this historical stage.

At the April and October (1985) CPSU Central Committee Plenums the questions of the improvement of the supervision and management of society were linked most directly with the profound changes of the material and technical base and the improvement of the system of relations. The economic development of society for all its importance is subordinate in the end to the task of the

assurance of the increase of the well-being and the creation of the conditions for the all-round development of the individual and the active struggle for the preservation of universal peace and the strengthening of security. The economic might of socialism is a reliable guarantor of its real influence on the progress of civilization and the prevention of the threat of nuclear war.

The main directions of economic and social development and the trends of the development of socialism into communist society are specified in the drafts of the documents of the 27th CPSU Congress. By the methods of forecasting and long-range planning the party is carrying out the scientific prediction of social progress. It is organizing and mobilizing the workers for the practical implementation of its policy and long-term and short-term programs and plans.

The party is carrying out its guiding function by political methods. "...Without a proper political approach to the matter this class will not maintain its domination," V.I. Lenin indicated, "and, CONSEQUENTLY, will also not be able to accomplish ITS PRODUCTION TASK" ("Poln. sobr. soch." [Complete Works], Vol 42, p 279).

"With the word 'management'," he emphasized, "they usually connect namely and first of all primarily, or even purely, political activity. Meanwhile the very foundations, the very essence of Soviet power...consist in the fact that political tasks hold a subordinate place with respect to economic tasks" (Vol36, p 130). Politics, of course, does not exhaust in details the entire essence of management, specifying merely its social orientation and the general principles and means of accomplishing management tasks.

Socialism for the first time introduced in practice a system of the planned management of economic and social life as a whole. The life of society—from its material and technical base and the formation of structures and relations to the heights of spiritual culture—under socialism to a greater and greater extent is being organized consciously, according to a unified plan. Here political supervision is of a complex nature, encompassing all spheres of human vital activity. It is carried out in the interests of all of society. Each relatively isolated sphere of labor activity and life acts here as an integral component of the whole system, which presumes the careful consideration of the general laws and their specific traits. This has nothing in common with superficial subjective notions.

V.I. Lenin considered extremely dangerous the aspirations to pass off "one's desires, one's 'opinions,' one's appraisals, one's 'intentions'" "at each step as the will of the workers, as the requirements of the workers' movement" (Vol25, p 245). A policy yields the anticipated results only when it has been formulated scientifically, when not simply knowledge, but a knowledge of the laws of the development of society with the precise consideration of its real possibilities and needs constitutes its basis. At the same time the scientific nature of political supervision is incompatible with the objectivistic absolutization of necessity. Its basic flaw consists in the loss of contact with society and classes. Marxism first of all establishes precisely which class determines this necessity.

The successful building of a new society takes place under the conditions, when the principle of scientific supervision is in inseparable unity with the principle of adherence to party principles. Effective supervision is always in adherence with party principles, if it expresses the interests of the workers. At the same time it is scientific, if it models the realities in the processes of objective laws.

Following Lenin's directives, the CPSU is constantly improving the relations of party, state, and economic management and is striving to clearly differentiate their functions. The party, in carrying out the political supervision of the work of state organs and public organizations, unites their efforts, improves the style and methods, and increases the overall efficiency and effectiveness of the entire system of management.

The present stage of our development is characterized by the fact that the processes of socioeconomic transformations are aimed at the speeding up of the advance of society to communism. The unity and continuity of socialism and communism, as two successive phases of the communist formation, are revealed with scientific precision in the new version of the CPSU Program. The previously existing notions of the possibility of the direct transition of socialist society, which has just been built, to communism are thereby eliminated. At the same time another extreme, when they believed that the building of communism begins only after the solution of all the problems of the improvement of developed socialism, is also overcome. In the draft it is emphasized that there is no sharp boundary between socialism and communism: the development of socialism, the more and more complete revelation of its possibilities and advantages, and the consolidation of the general communist principles inherent in it also signify the real movement of society toward communism.

To avoid running ahead the document records the important conclusion that the country has entered the stage of developed socialism. This means that the long path of the development of socialist society still has to be covered. The draft of the third CPSU Program in its present version is the strategy of the systematic and comprehensive improvement of socialism, the raising of productive forces and social relations to a qualitatively new level, and the solution of urgent social problems. The inexhaustible possibilities and advantages of the socialist system in combination with the achievements of the scientific and technical revolution will be used for the accomplishment of these historical tasks.

A clear strategy of the acceleration of the pace of economic and social development with its structural reorientation and the assurance of the highest world level of labor productivity and the efficiency of management was formulated on the basis of the latest scientific discoveries, the gained experience, and forecasting studies and estimates.

It is a question of the doubling during the coming 15-year period of the production potential and national income and of the increase of labor productivity by 2.3- to 2.5-fold and the real income of the population by 1.6- to 1.8-fold. It is planned to increase the public consumption funds by twofold.



As we see, in conformity with the requirements of the basic economic law of socialism, man with his increasing demands and interests is at the center of attention of the CPSU. The steady increase of the material and spiritual standard of living of the people, the transformation of the conditions of labor and all vital activity, the assurance of the harmonious development of the individual, and the firm establishment of the socialist way of life were made the basis of the aims of the drafts of the CPSU Central Committee for the party congress.

The following basic factors in essence act as the decisive means of achieving the outlined goals.

THE FIRST OF THEM is scientific and technical progress, the changeover of production to intensive, resource-saving technologies of the low-waste or entirely waste-free type, and the speeding up of the processing of circulation. The qualitative and structural updating of the national economy and the assurance of the output of both technological complexes and products and services in a strictly balanced conformity with the changing needs and requirements are envisaged for this. Hence the priority requirement--to organize the mass production and introduction of flexible self-adjusting systems, the sharp broadening of the assortment and the increase of the quality of items, which eliminate shortages and the output of goods which are not in demand by the consumer. Scientific and technical progress has to be turned into a cost-reducing factor, a substantial increase of the output and revenues on the basis of the same resources has to be ensured, that is, the resource intensiveness and production cost of a unit of the final product have to be decreased.

THE SECOND ONE is the utmost stimulation of the human factor, the development of the lofty sense of being the socialist manager, of duty to society, economic responsibility, initiative, and economic enterprise; the raising to a qualitatively new level of professionalism and the standards of human interrelations, which correspond to the new stage and the requirements of the management of highly intensive production and circulation.

THE THIRD ONE is the changeover to more advanced methods of economic management and the introduction of a new economic mechanism. The principle of democratic centralism and effective structures of management under the conditions of the optimum combination of centralism with the cost accounting independence of enterprises, associations, sectors and regions, and integrated economic systems is its basis. Here the promotion to management positions of different levels of personnel, who have a good command of the new methods of management and are capable of organizing the matter of the acceleration of scientific and technical progress and the intensive management of the economy, is of enormous importance.

These steps are being insistently implemented and are yielding positive results. The CPSU Central Committee and the Soviet Government are actively improving the management structure, orienting it toward the changeover of all industry and construction, the sphere of the agroindustrial complex, and the



infrastructure to the new methods which were checked by the large-scale economic experiment.

The strategy of the CPSU is aimed at profound changes in the content and nature of labor and the material and spiritual conditions of the life of people and the stimulation of the entire system of political, social, and ideological institutions. Here the aspect of the improvement of socialist production relations is especially singled out, and not only as a consequence, but also as an active factor of the reaction to the increase and qualitative transformation of the productive forces of society.

In this connection the oversimplified notions with respect to the all but automatic, unproblematic following of production relations after changing productive forces have to be overcome. In reality the correspondences of the two decisive aspects of the mode of production do not reproduce each other, but require purposeful work on the improvement of the entire economic system of socialism.

The force of inertia, the conservatism of thought, and the retention of static, obsolete economic and social forms, which hinder socioeconomic and spiritual progress, are especially intolerable. The more well-founded solution of the problem of the creation of stable economic conditions for the cost accounting activity of labor collectives and the increase thereby of their real economic responsibility for the ultimate effectiveness lies ahead.

The task of turning resource saving into a decisive source of the meeting of the increasing needs of the national economy is posed in the drafts of the Basic Directions and the new version of the CPSU Program. In other words, the task is for resource saving to become in practice one of the main criteria of the quality of management. It has been calculated that the saving of just 1 percent of the material resources is equivalent to the increase of the national income by approximately 7 billion rubles. But in order to produce all over again the same amount of fuel or metal and to generate the same amount of power, it is necessary to spend fourfold more assets.

The concept of the unity of resource saving and resource productivity, along with the development of computer-aided production systems with flexible adjustment for the output of new items, is one of the main directions of the intensification of the socialist economy. Now the foremost principle of skillful management consists not in getting some more resources, but in using them better and increasing the return. The economic search for the increase of efficiency should first of all be concentrated on this. It is a question of aiming expanded reproduction in the direction of its resource-saving forms.

In what way is it possible to solve the problem of resource saving and resource productivity? First, it is necessary to consume material and energy resources economically per unit of the final product, not to allow their losses, above-standard reserves, and squandering for other purposes, which are not connected with the given process, and to stay strictly within the established standards, revising them in good time as technology is improved.

Second, and this is the main thing, it is necessary to develop more rapidly and to use extensively resource-saving equipment and waste-free and low-waste technology.

Third, to ensure the complete use of natural resources with the extraction for the needs of the national economy of all the useful components. Here the broadening of the scale of the commitment to the economic turnover of secondary resources and their conversion into a reliable source of the obtaining of the necessary raw materials and materials for the development of production are acquiring greater and greater importance.

Fourth, the development and mass production of new advanced materials and the efficient replacement of expensive and scarce resources with ones which are less expensive and not scarce, especially those which are available in unlimited amounts.

Fifth, the use of a more advanced mechanism of economic management and the stimulation of the highly efficient use of material and energy resources, the shaping of new economic thinking, and the persistent combating of their losses in any form are necessary.

The task of resource saving in the national economy of the republic at present is being accomplished by the expansion of the use of low-waste and waste-free resource-saving technologies, new construction materials, and substitutes of scarce raw materials and the output of products of increased prefabrication. Technological systems and complexes for the commitment to production of secondary material, raw material, fuel, and energy resources and industrial and household waste products are also being introduced more and more actively.

The system of republic, sectorial, and regional scientific and technical programs is also aimed at the solution of the important, first of all intersectorial, problems of the saving of resources. This made it possible during the past five-year plan to decrease the materials-output ratio of the products being produced by 3.7 percent instead of 1.9 percent in accordance with the five-year plan and to derive a national income of 3.7 billion rubles. However, the reserves and potentials, which are available in this respect, have still been used far from completely.

The intensification of social production on the basis of the acceleration of scientific and technical progress involves the qualitative transformation of production technology and the system of organizational economic and production relations. It is a question of creating the material and economic prerequisites for the achievement of the highest world level of labor productivity.

The accomplishment of the task of the practical doubling of the production potential of the country, which was posed in the draft of the Basic Directions, first of all is oriented not toward the simple increase of production capacities, but toward such an increase of them, which is based on the latest achievements of science and technology, that is, toward cardinal qualitative capital replacement. Fundamentally new equipment and its development and large-scale use are the basis of retooling. In combination

with advanced technology and an advanced organization of production, new equipment becomes a real factor of the dynamism of the entire system of relations and the social structure of society.

The rapid updating of the production system, first of all by the replacement of inefficient equipment with advanced, high-performance equipment, that is, by the priority replacement of the active portion of productive capital, is envisaged by the draft of the Basic Directions.

Objectively the process of retooling begins with the sectors which produce means of production--the machine building complex. Taking into account that the main task of the technological updating of the national economy is being assigned precisely to it, it will be developed at a leading pace. In particular, the output of products of machine building and metal working will increase during the 12th Five-Year Plan by 40-45 percent, with an overall growth rate of the output of the processing sectors by 25-28 percent and with an increase of the volume of the output of group A of industry by 20-23 percent.

The leading output of heavy and single-design machine tools and presses and of equipment for the automation of the assembly of mass items and the substantial expansion of the output of machine tools of especially high precision, automated and robotized complexes, and flexible machine systems are envisaged.

On the one hand, the further development of specialization and standardization, with the simultaneous cooperation and integration of the final cycles and the increase of the degree of automation and continuity and, on the other, the more precise consideration of the demands of the consumer with respect to the quality, reliability and inexpensiveness, and efficiency of the machine systems being produced are the general line of the development of machine building itself.

Here the shortening of the cycle "from the idea--to introduction" of new items, which involves the development of the output of means of automation of engineering labor and small high-performance computers for scientific research, design, and technological developments, as well as the formation of new organizational forms of the integration of science and production, is a very important task.

Intersectorial scientific production complexes and centers are being established for the speeding up of the solution of important scientific and technical problems. Major scientific and scientific and technical programs of national economic importance not only for our country as a whole, but also for the entire world socialist system are being formulated.

The scientists of the Ukrainian SSR Academy of Sciences are well aware of their place and the enormous role which they are called upon to play in the accomplishment of the posed tasks, which are imposing in their scale. Precisely for this reason each labor collective is approaching with great responsibility the elaboration and implementation of measures which are aimed at the acceleration of scientific and technical progress and the solution of the urgent problems of socialist management.



One should emphasize the important peculiarity of the activity of our academy, that it is constantly concentrating the efforts of scientists on the development of goal-oriented basic research, with outlets to the development of qualitatively new technologies and technical, organizational, and economic solutions.

The developments of scientists of the academy are having a considerable influence on the formulation and pursuit of a progressive scientific and technical policy and the forecasting of the developments of science, technology, and socioeconomic and spiritual processes. Serious attention is being devoted here to the questions of their introduction in practice. During the 11th Five-Year Plan about 7,000 scientific developments were used in the national economy and an estimated economic impact in the amount of 5,544,000,000 rubles, in which the share of the academy comes to 3,034,000,000, was obtained.

The institutions of the Ukrainian SSR Academy of Sciences are maintaining fruitful creative relations with enterprises and organizations of more than 50 USSR ministries, 24 ministries and departments of the Ukrainian SSR, and 10 ministries of other republics. In all 56 problem scientific research subdivisions of 29 ministries are operating at institutes of the academy.

In recent years scientific technical complexes and engineering centers have been formed on the basis of the leading scientific institutions of the Ukrainian SSR Academy of Sciences. Their activity is contributing to the speeding up of the development and industrial assimilation of important technological solutions. At the conference in Moscow on questions of the acceleration of scientific and technical progress and during a visit to our republic Comrade M.S. Gorbachev spoke approvingly of the work of the academy on the improvement of the forms of the integration of science and production and emphasized the need for the establishment in the country of interbranch scientific technical centers following the example of the Institute of Electric Welding imeni Ye.O. Paton. Recently the government adopted a decision on the establishment of a broader network of complexes of this sort in the leading scientific and technical directions.

The technologies being developed by the institutes of the academy are being submitted for consideration by the Collegiums of the USSR State Planning Committee and the Ukrainian SSR State Planning Committee and by the collegiums of ministries and departments for the assurance of their planned large-scale assimilation, first of all in the sectors of machine building.

A large amount of research is aimed at the implementation of the Energy Program, including the development of atomic energy, which is of especially great importance for the republic.

Scientists of the Ukrainian SSR Academy of Sciences are also performing much work in the interests of the implementation of the Food Program. More than 200 developments in the area of the chemicalization of plant growing and animal husbandry, the development of new strains and the technologies of their cultivation, and the search for fundamentally new methods of the complete



processing and storage of agricultural products are being fulfilled at 65 institutions.

A decree of the USSR State Planning Committee recommended 37 works for inclusion in the State Plan for the 12th Five-Year Plan and 39 for inclusion in the sectorial plans of ministries and departments. Their extensive use will yield a significant economic impact. It is planned to broaden the scale and to intensify substantially the basic research and development of fundamentally new technologies, which ensure revolutionary changes in the food complex. The degree of our participation in the republic Agroindustrial Complex Program is inferred from the fulfillment of 16 assignments of the first level.

The research, which is aimed at the implementation of the Comprehensive Program of the Development of the Production of Consumer Goods and the Service Sphere for 1986-2000, is acquiring greater and greater importance. It is being conducted at 24 institutions of the academy. A number of developments, which are contributing to the enlargement of the assortment and the improvement of the quality of goods, have been proposed on the basis of the obtained results.

The policy of priorities is of great importance for the successful solution of the problems in the outlined and other directions. In developing basic research in the areas of the modern natural sciences, social science, and technical sciences, the collectives of the institutes of the Ukrainian SSR Academy of Sciences are attaching foremost importance to the elaboration of the theoretical principles of fundamentally new types of equipment and technology, which are capable of providing a multiple increase of labor productivity, a substantial saving of energy and material and technical resources, and the sharp increase of product quality. Simultaneously with this more effective forms and methods of planning and management, material incentives and stimulation, the communist education of man, and the spiritual development of society are also being developed.

The comprehensive solution of the present problems, it is emphasized in the draft of the new version of the CPSU Program, requires the intensification of the integration of the social, natural, and technical sciences. The particular importance of all the fields of knowledge in the development of productive forces and social relations consists in this.

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## REGIONAL ISSUES

### SCIENTIFIC, TECHNICAL PROGRESS IN URALS REGION

Moscow PRAVDA in Russian 24 Apr 86 p 2

[Article by PRAVDA special correspondents V. Danilov and V. Reut (Sverdlovsk): "A Question Not Only for Scientists. After a Line of the Decisions of the 27th CPSU Congress"]

[Text] The small city of Rezh of Sverdlovsk Oblast perched comfortably on the banks of the small river of the same name. A typical Ural settlement, which emerged, like many others, owing to the vast wealth of the underground stores of the Kamennyy Belt. We were to familiarize ourselves with the scientific research laboratory of dual subordination, which was organized at the Rezh Nickel Plant by the efforts of the Institute of Metallurgy of the Ural Scientific Center of the USSR Academy of Sciences.

The first opinions, which we heard from the workers of the enterprise, turned out to be more than approving:

"Oh! This is our research shop!"

"What specifically does it yield?"

"Specifically? For example, it saved us a mine...."

It was probably said too strongly. But essentially it is correct. The "research shop," in which there are only 15 people (10 from the institute, 5 from the plant), designed and placed into operation a unit, which sharply increases the degree of extraction of nickel from local ore, improved the technology of electric melting, and organized the complete processing of waste products. If everything is taken into account, it will turn out that from the same quantity of raw materials they are now obtaining much more output than before. If it were not for the work of the laboratory, the plant, in order to produce the same amount of metal, would have to worry about another mine and to build in addition melting furnaces.

"Our laboratory and the work in Rezh," Doctor of Technical Sciences A. Okunev relates, "are not simply the contact of the institute with production, but a kind of small association of the academic institution with the plant. An association for great mutual benefit."

The experience proved to be convincing, and the Ural Scientific Center is striving to use it as extensively as possible. The Institute of Chemistry established a laboratory of dual subordination at the Kirovgrad Plant of Hard Alloys. The Institute of Plant and Animal Ecology did so at several higher educational institutions.

The program of the acceleration of the economic and social development of the country, which was advanced by the 27th CPSU Congress, envisages the need to develop such organizational forms of the integration of science, technology, and production, which make it possible to ensure the efficient and quick passage of scientific ideas from origination to extensive use in practice. The enlistment of scientists in the renovation of enterprises affords great opportunities for this. For example, jointly with workers of the Moscow State All-Union Institute for the Planning of Metallurgical Plants and the Ural State Institute for the Planning of Metallurgical Plants the staff members of the Ural Scientific Center prepared the design documents for the changeover of the Staroutkinsk Metallurgical Plant to the production of iron powders. The pilot industrial section is being prepared for start-up. The planned complex of shops will enable the enterprise to rise to a modern technical level.

Ural scientists will give serious assistance to tens of plants. During the past five-year plan the annual impact from the implementation of the achievements of science and technology in industry of Sverdlovsk Oblast came to about 150 million rubles, the labor on the average of more than 15,000 people was saved. Now the collective of the Ural Scientific Center regards this impact as inadequate.

The Institute of Metallurgy jointly with other scientific and planning organizations set itself the goal to use the results of a number of important scientific studies during the renovation of the Kachkanar Mining and Ore Dressing Combine. The main thing here is the retooling of the pellet factory. On the same area and with the same personnel the output of products, moreover, of high quality, will increase by more than 1.5-fold. This is equivalent to the placement into operation of another factory, the construction of which would cost twofold more as compared with renovation. The introduction of the method of the agglomeration and partial metallization of pellets, which does not have analogs in world practice, is at the basis of the retooling. Their use will increase by 8-10 percent the output of blast furnaces and will decrease the consumption of coke and natural gas. The program of the renovation of the factory was approved by a joint order of the USSR Minister of Ferrous Metallurgy and the President of the USSR Academy of Sciences. The periods of the stages of renovation have been specified and the managers, who are responsible for the coordination of the work, research, and industrial tests of the new technology, have been appointed. In short, cooperation has been organized, as they say, at the highest level.

It should be that way more often! Especially when the efforts of different ministries are required for the introduction of the results of scientific research. For example, in case of the solution of the problems of the complete use of raw materials, which for the Urals with its most abundant natural resources is of particular importance. However, a situation of

"unrequited love" frequently arises precisely here. Two large enterprises--the Bogoslovskiy and Uralsk Aluminum Plants--process bauxites. The obtained metal is put to use, while the other product of processing--what are called "red muds"--go to the dumps. They already occupy approximately 300 hectares, but newer and newer mud storages, on the construction and maintenance of which millions of rubles are being spent, are being created. The losses of fertile lands are increasing, the environs of the enterprises are being polluted.

Meanwhile red muds are a most valuable raw material. They contain iron, alumina, and other substances, the value of which amounts to 70 to 80 percent of the total value of the components which form the ore. The Institute of Metallurgy of the Ural Scientific Center with other scientific and planning organizations solved long ago the problem of using red muds. The method of their waste-free processing with the use, in particular, of conversion pig iron, alumina, and cement was developed and checked on a semi-industrial scale. It was proposed to reequip for this purpose the second alumina shop of the Bogoslovskiy Aluminum Plant which is experiencing a shortage of raw materials. Given the annual consumption here of 2 million tons of red muds commodity production worth 110 million rubles would be produced and the profit would come to 38 million rubles. However, the suggestion of scientists was never adopted.

Why? If you dismiss various kinds of "objective," in many respects far-fetched reasons, it is mainly because the wealth of the mud dumps is too diverse. The Ministry of Nonferrous Metallurgy, if it were to undertake their processing, does not need iron and cement. Why should it take trouble with their obtaining and marketing? The Ministry of Ferrous Metallurgy and the USSR Ministry of the Construction Materials Industry as if need respectively metal and cement, but their sources are in a different sector. Departmentalism and the reluctance to deal with "others'" business held up the implementation of the plan of the complete use of natural raw materials.

Now, I dare say, you would also not call new the proposed technology of the recovery of red muds--many years have passed since the time of its origin. Several other scientific developments, for example, the technology of using pyrite binders, are also becoming obsolete, without being implemented. Of course, a certain portion of the blame for this also falls to scientists. They far from always fight persistently for the implementation of the achievements of science. But the weak interest of some enterprises in business cooperation with scientific organizations also has an effect. Even an innovation, which has shown its worth well under production conditions, opens a way into life with difficulty.

On the display screen there is a narrow shiny stripe. A straight and, it would seem, fixed one. Suddenly it flickered and disintegrated, having turned into dancing points. For an instant it disappeared, then reappeared. This means that the instrument, which is sliding over a metallic item, has discovered in it a cavity or extraneous inclusion, has let the site and size of the defect be known, and has proceeded to study the next section. The instrument, which operates on the basis of the phenomena of magnetism, is simply called a flaw detector.



"It sees everything and never makes a mistake, which is especially important for quality control," notes L. Pravdin, senior scientific associate of the Institute of Metal Physics of the Ural Scientific Center of the USSR Academy of Sciences.

Indeed, take, for example, steel pipes. The reliability of petroleum and gas pipelines and the reliability of various machines and devices depend on their strength. But at times at plants they now also still get by with the spot checking of pipes under high pressure or with a fracture test. This is exacting and expensive and does not rule out that precisely the pipe with flaws will turn out to be unchecked. But the flaw detector, which was proposed by the institute, does rule it out. The device of the nondestructive testing of the welds of electrically welded pipes, which operates on its principle, blends with the technical process as a component of it. In contrast to the laboratory instrument the device is fixed, the pipes move under it. And if among them there proves to be if only one with a tiny flaw, a bell rings or a siren sounds, while the site of the defect is automatically marked with paint.

Similar devices are in operation at six enterprises of the country. A temporary scientific and technical laboratory (NTL), in which workers of the institute cooperate closely with specialists from the central plant laboratories, was organized for their introduction. The introduction of nondestructive testing at the Seversk Pipe Plant alone provided an annual saving of more than 200,000 rubles.

The usefulness of such subdivisions is recognized. It is planned to increase the number of temporary scientific and technical laboratories at the Ural Scientific Center. They have to develop wear-resistant coatings for the parts of machines (the Institute of Chemistry), to introduce the methods of magnetic hydrodynamics in the production of titanium (the Institute of Continuum Mechanics), and to fulfill other tasks.

But let us return to the same narrow stripe on the screen of the flaw detector, which warns without error about flaws in metallic items. It would seem that it is a splendid weapon in the campaign for high product quality and for the honor of the trademark. However, the stripe began to light up many years ago, while the flaw detector entered production practice comparatively recently, and then only at six enterprises of the country. True, here the staff members of the Institute of Metal Physics are also to blame--they delayed too long the organization of the temporary scientific and technical laboratory which developed the device of the nondestructive testing of the welds of electrically welded pipes. But after this the matter also did not proceed that quickly.

"The device is good," the director of one of the plants noted hesitantly. "But will it not decrease the indicator of the quality of our products?"

Well, I never! Not the actual product quality, but the indicator, it turns out, worries the director. The essence of this, it would seem, paradoxical opinion lies in the following. Pipes now, as they say, are in great demand, and the enterprise sells without trouble everything that is devoid of an

obvious flaw which is visible to the unaided eye. With the introduction of nondestructive 100-percent testing the items, which also contain a deeply concealed defect, which will be detected, perhaps, not soon, somewhere during the operation of a pipeline or oil well, will have to be rejected. And then the operators themselves as if will be "to blame."

There is no denying that scientific and technical laboratories are useful for the improvement of equipment and production technology. In spite of difficulties of various kinds, they create an atmosphere of innovation in the collectives of enterprises and a creative approach to the fulfillment of the tasks facing them. But today greater demands are also being made on academic institutions. It is a matter, in particular, of the establishment of engineering centers, experience of which has already been gained and has justified itself well, for example, at scientific institutions of the Ukrainian SSR Academy of Sciences.

We are speaking about this with Academician N. Vatolin, first deputy chairman of the Presidium of the Ural Scientific Center of the USSR Academy of Sciences and director of the Institute of Metallurgy. Yes, plans of the establishment of engineering centers exist, there are also more than enough problems which it is expedient to solve by means of them.

"But for the present there are only plans and problems," the scientist concludes. "It has not yet gotten down to business, since the plans have not been backed materially and technically. There is no pilot production base or even simply facilities, in which it would be possible to locate these centers."

He points to the new building which is being built next to the institute.

"We will build it on our own. The experimental subdivision of our institute will be here. Not soon, in general, since our construction forces are small...."

About 10 years ago we went to this site, which had been set aside for the construction of the academy campus. At that time the first floors of the two buildings under construction of the Ural Scientific Center were arising here, on the vast meadow surrounded by forest. They said to us with pride that soon a complex of scientific institutes would arise here. But, after the first two buildings, which marked the beginning of the construction of the campus, nothing more arose. Is that not too little for 10 years?

Recently the Presidium of the USSR Academy of Sciences decided to organize in Sverdlovsk an affiliate of the Institute of Machine Science imeni A.A. Blagonravov. The directions of the work of the affiliate were also approved. This subdivision is exceptionally important for the region with developed machine building, and it will have much to do here. The affiliate is the 15th academic institution in the Urals. It is quite clear that the broader the range of the potential opportunities of the Ural Scientific Center to influence the scientific and technical progress of the national economy of the region becomes, the more urgently its need for its own experimental and pilot production base is felt.

The scientists of the Urals picture the scale and difficulty of their tasks in the fulfillment of the decisions of the 27th CPSU Congress and are outlining the corresponding program of actions. How successfully will it be implemented? This question, which applies, of course, first of all to scientists themselves, must be addressed not only to them.

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## CONFERENCES AND EXPOSITIONS

### SUPREME SOVIET PREPARATORY COMMISSION FOR SCIENCE, TECHNOLOGY

Moscow IZVESTIYA in Russian 4 Jun 86 p 2

[Article by IZVESTIYA special correspondent A. Ivakhnov under the rubric "The USSR Supreme Soviet Before the Session": "The March of Technical Progress. The Joint Preparatory Commission for Science and Technology Meets"]

[Text] At the end of last year this preparatory commission discussed the draft of the State Plan with respect to the section "The Development of Science and Technology" for 1986. The agenda of the current session concerns the draft of the State Plan for 1986-1990. The theme of the discussion in principle is the same: whether the plan, which was prepared for approval by the session of the USSR Supreme Soviet, fully conforms to the policy of our party of the increase of the pace and effectiveness of the development of the economy of the country.

The reports of First Deputy Chairman of the USSR State Planning Committee A. Reut and Deputy Chairman of the USSR State Committee for Science and Technology S. Yefimenko for their most part were alike, and no one had a grievance against the speakers. As never before, these two committees, while working on the draft of the most important of the state plans with the enlistment of a large number of specialists from various fields, were as if merged into a unified "brain center."

In particular, it was reported to the deputies that the basic indicators of the five-year plan had been supplemented by the special section "Scientific and Technical Progress." The assignments on the support of the activity of interbranch scientific technical complexes were set apart by a separate volume. As during the past five-year plan, the all-union scientific and technical programs, of which there are now 160, are an important component of the plan. The indicators of the reliability and life of the equipment being produced are being incorporated in the plans for the first time.

However, as the speakers noted, there are still many bottlenecks in the increase of the technical level of products. Thus, for example, the examination, which was made at a number of ministries, showed that approximately 1 machine in 7 of the ones, which it is planned to produce during the current five-year plan, in reliability is inferior to the highest world level, while of the ones being developed 1 in 12 does not satisfy the



long-range requirements. The drafting of the model Statute on the Interbranch Scientific Technical Complex has been dragged out unjustifiably.

The results of the fulfillment of the plan on the development of science and technology during the first quarter of 1986: 87 percent with respect to the introduction of new equipment and 91 percent with respect to the assignments of scientific and technical programs, aroused alarm. There is one conclusion: the executives of a large number of ministries, and among them, unfortunately, the machine building ministries, have not yet fully realized the urgency of the changeover of the economy to the path of intensive development.

"Has an effective mechanism of introduction been developed? What steps are planning organs taking in order to interest sectors in the implementation of advanced ideas, regardless of their authorship?"

Deputy I. Kubilyus, rector of Vilnius State University imeni V. Kapsukas, asked this question. In answering it, the speakers cited cost accounting, which will force enterprises to introduce what is new, and the new forms of financing, which envisage markups or, on the contrary, sanctions depending on the technical level of the output being produced. In the opinion of the deputies, which Deputy V. Koptuyg, chairman of the preparatory commission, generalized, the USSR State Planning Committee and the State Committee for Science and Technology are idealizing the situation. The taken steps are reassuring, but so far cardinal changes are not visible in the settlement of this question. If the monitoring of the introduction of advanced inventions and scientific developments is relaxed today, by the end of the five-year plan we will reap bitter fruits.

The next speaker--Chief Scientific Secretary of the Presidium of the USSR Academy of Sciences G. Skryabin--reported that two equally important tasks face academic science: the implementation of the scientific reserve, which was created during the preceding period, for the development of new equipment and advanced technology and the leading development of basic science--it provides the basis for applied research and provides firm prospects with respect to key problems. The accomplishment of both tasks in many respects depends on the strengthening of the material base of the institutes, which are subordinate to both the USSR Academy of Sciences and the republic academies.

In conformity with the recently adopted decisions, academic science should be supplemented by new institutes--in particular, ones of the technical type. You will not establish these institutions in a void--new buildings, pilot industrial bases, and personnel are needed. Modern instruments are needed--this question is especially urgent. Many institutions do not have the necessary production and laboratory facilities. In December of last year scientists sent to planning organs suggestions on the strengthening of the material and technical base of academic science. Unfortunately, the speaker said, we know nothing of the results of their examination. The planned investments in science do not satisfy its needs.

Deputy Chairman of the USSR State Committee for Standards V. Yunitskiy said that the plan of state standardization during the current 5-year period is aimed at the substantial increase of product quality. About 300 standards

with long-range requirements will be developed for machine building. A program of the metrological support of sectors has been approved jointly with the Ministry of Instrument Making, Automation Equipment, and Control Systems.

The experiment on the state acceptance of products, which are subordinate to the USSR State Committee for Standards, is concluding at 12 enterprises. At the beginning of the experiment only 10-20 percent of the products were turned over upon first presentation at these enterprises. Owing to the improvement of the technology and the replacement of accessories and means of control, this level has been increased to 95 percent. Starting in 1987 the state acceptance of products will be introduced at another 740 enterprises of various sectors.

Having noted the considerable and useful work of the State Committee for Standards, the deputies directed attention to a number of problems which still remain outside the sphere of attention of the committee. Thus, Academician V. Semenikhin came out in favor of the need for the development of a standard for the conditions of the storage of agricultural equipment. Deputy P. Solovyev posed the question of the need for the carrying out of certification at the stage of the technical assignments and conceptual designs. Deputy N. Borisevich noted that the advanced methods of measurements, which had been proposed by academic institutes, did not find a place in the draft of the State Plan.

The next speaker, Chairman of the Higher Certification Commission V. Kirillov-Ugryumov, acknowledged that the Higher Certification Commission has not yet achieved the dependability of all of the units of the passage of a dissertation. Up to 400 dissertation works are rejected annually as not satisfying the demands being made. The percentage of doctors and candidates of sciences of the technical type is too small. The suggestion that academic degrees be awarded to engineers and designers, whose works have become the basis for the development of new technology and advanced equipment, is being considered.

The deputies heard the report of USSR Deputy Minister of Higher and Secondary Specialized Education I. Makarov.

"We regard as the greatest complaint about the work of the higher school," the speaker said, "the inadequate pace of scientific and technical progress and the decrease of the prestige of engineering labor. It is important to increase the national economic return of science of the higher educational institution. More than half of the doctors and candidates of sciences work within the walls of higher educational institutions, but the amount of research being conducted by them comes to only one-tenth of all science in the country."

In the opinion of the speaker, the budget allocations for the development of science of the higher educational institution, which are envisaged by the draft of the State Plan, are insufficient for the accomplishment of the proposed tasks. The problem of supplying higher educational institutions with instruments, equipment, and computer hardware is not being completely solved.

The speaker devoted particular attention to the introduction of the scientific developments of the higher school. When formulating the draft of the five-year plan, which is now being discussed, he said, 1,400 suggestions were sent to sectorial ministries. However, only a negligible portion of them were included in the plan. The sectors, for their most part, see in science of the higher educational institution their competitors and do not want to introduce "others'" developments.

Deputy L. Nersesyan, deputy chairman of the Armenian SSR Council of Ministers, emphasized that the higher school is using inadequately the means of industry. It is advisable to develop standards of the participation of sectors in the development of the material and technical base of the higher school.

Academician V. Koptug, chairman of the preparatory commission, summarized the discussion:

"Difficult tasks face the higher school today. For a long time the necessary assets were not invested in it, capital construction was carried out too slowly. Now is the time when it is necessary to help the USSR Ministry of Higher and Secondary Specialized Education and to increase the investments. And when the higher school and science of the higher educational institution have gained strength, they will be held strictly accountable."

The discussion of the reports is over. The conclusion is being prepared. The deputies are weighing carefully each phrase, at times each word. Their recommendations are called upon to make improvements in the national economic plan, which after approval at the session of the USSR Supreme Soviet will become law.

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LENINGRAD OBLAST PARTY COMMITTEE EXAMINES HEALTH CARE

Leningrad LENINGRADSKAYA PRAVDA in Russian 22 Mar 86 p 1

[Article (LENTASS): "In the Oblast Committee of the CPSU"]

[Text] The measures, which are aimed at the fulfillment of the task posed by the 27th party congress on the meeting everywhere of the needs of the population for high-quality preventive medical and medical assistance, were discussed at the regular meeting of the bureau of the oblast committee of the CPSU.

It was noted that during the 11th Five-Year Plan definite improvements in the solution of this problem had occurred in Leningrad and the oblast. The regional Health Program was devised and is being implemented. The network of health care institutions was broadened, the material and technical base of several of them was strengthened, individual indicators of the activity of hospitals and polyclinics improved.

At the same time a fundamental change in the improvement of the medical service of people did not come. A large number of complaints about the low quality of medical assistance, the unsatisfactory work of the personnel of medical institutions, and the shortage of a number of medicines in the drugstore network are being received from citizens by party and soviet organs.

Many hospitals are overcrowded. The wear of the fixed capital of the sector is significant.

The existing shortcomings are connected with the serious oversights in the construction and capital repair of health care facilities. In the past 5 years about 34 million rubles of capital investments were not assimilated at them. This attests that in the construction main administrations and organizations they are still treating the building of social facilities as a secondary matter.

The assets of industrial enterprises and sovkhoses are being poorly attracted for the construction of preventive medical institutions. So far a number of such large associations as the Leningrad Admiralty Association, the Izhorskiy zavod Association, and others do not have their own hospitals. Less than half of the central sovkhos farmsteads have medical dispensaries.



The voluntary assistance to medical institutions on the part of enterprises and organizations lags behind the requirements of the times.

The executive committees of the Oblast and Leningrad City Soviets of People's Deputies, the rayon and city committees of the CPSU, and the primary party organizations have not been able to increase the accountability of the managers, who are responsible for the slow pace of the development of the base of health care, and to organize the effective and efficient monitoring of the fulfillment of the decrees which have been adopted on these questions.

The cases of formalism in the organization of preventive medical assistance and the inefficient use of the available beds have not been eliminated. Modern methods of the diagnosis and treatment of a number of diseases and means of small-scale mechanization are being introduced slowly. The possibilities of medicine for the combating of drunkenness and alcoholism are not being used extensively enough.

The Administration of Preventive Medical Assistance to the Adult Population of the Main Administration of Health of the Executive Committee of the Leningrad Soviet is not ensuring the necessary reform of the style and methods of work. Health care organs are devoting too little attention to work with personnel, the training of intermediate medical personnel, and the improvement of the social and living conditions of the workers of the sector.

The organization of the educational and training process at medical higher educational institutions and schools and the planning and coordination of the corresponding scientific research have not achieved the proper level.

For serious oversights in the work on the selection, placement, and training of medical personnel the bureau of the oblast committee of the CPSU gave O.K. Savelyev, deputy chief of the Main Administration of Health of the Executive Committee of the Leningrad Soviet, a reprimand with an entry on his record card, he was relieved of the position he held.

For substantial shortcomings, which were allowed in the medical service of citizens, T.I. Shilo, chief of the Administration of Preventive Medical Assistance to the Adult Population of the main administration, was given a strict reprimand. It was recommended to the Executive Committee of the Leningrad Soviet to strengthen the management of this administration.

The unsatisfactory level of supervision on the part of G.A. Zaytsev, chief of the Main Administration of Health of the Executive Committee of the Leningrad Soviet, was noted, he was given a reprimand with an entry on his record card.

The poor monitoring of the construction of health care facilities was pointed out to F.G. Korzhenevich, deputy chief of the Main Administration for Housing, Civil, and Industrial Construction of the Leningrad City Soviet, and he was given a reprimand with an entry on his record card, he was strictly warned about the intolerability of delaying the dates of the turning over of health care facilities. The Moskovskiy Rayon Committee of the CPSU was charged to examine the causes of the disruptions of the placing into operation of such

facilities by trust Nos 4, 5, and 16 of the Main Administration for Housing, Civil, and Industrial Construction of the Leningrad City Soviet and to make the guilty parties strictly accountable to the party.

The buro of the oblast party committee obliged party, soviet, trade union, and Komsomol organs and the executives of the Main Administration of Health of the Executive Committee of the Leningrad Soviet and the Department of Health of the Executive Committee of the Leningrad Oblast Soviet, and drugstore administrations to take exhaustive steps on the cardinal improvement of the state of affairs in the sphere of the medical service of the population and the training and education of personnel. Particular attention was directed to the need for the increase of the level of the work in this direction of the primary party organizations of medical institutions.

At the meeting of the buro of the oblast committee of the CPSU in light of the directives of the party Central Committee the problems of the attachment of personnel to enterprises of light industry were discussed and specific steps on the improvement of the working and living conditions of the workers of the sector and on the allocation of living space for them were specified.

Several other questions of party supervision were also considered.

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## GENERAL

### STATUTE ON MACHINE BUILDING SPECIFICATIONS CLARIFIED

Moscow EKONOMICHESKAYA GAZETA in Russian No 17, Apr 86 p 18

[Commentary of the Technical Administration of the USSR State Committee for Standards on the decree of the USSR Council of Ministers "On the Improvement of the Procedure of the Drawing Up and Coordination of Technical Specifications in Case of the Development and Delivery to the Works of New (Modernized) Products of Machine Building" under the rubric "New Official Materials": "Technical Specifications and Standards"; first two paragraphs are EKONOMICHESKAYA GAZETA introduction]

[Text] The decree of the USSR Council of Ministers "On the Improvement of the Procedure of the Drawing Up and Coordination of Technical Specifications in Case of the Development and Delivery to the Works of New (Modernized) Products of Machine Building" attracted the attention of many readers of the weekly. The procedure established by it simplifies significantly the coordination of the specifications at all the stages of the work on the development of new equipment and differentiates their content subject to the specific nature of the product and the nature of its production.

The commentary published below of the Technical Administration of the USSR State Committee for Standards tells about what new things this decree introduces in the practice of the drawing up and coordination of specifications.

"The Procedure of the Drawing Up and Coordination of Technical Specifications in Case of the Development and Delivery to the Works of New (Modernized) Products of Machine Building" was approved by the USSR Council of Ministers in conformity with the decisions of the June (1985) conference in the CPSU Central Committee on questions of the acceleration of scientific and technical progress. The great attention to this question stems from the fact that in modern production precisely when drawing up the technical specifications the quality of a product is established and it is determined whether or not it will conform to the highest world achievements.

#### The Developer and the Client

The procedure, which was approved by the USSR Council of Ministers, envisaging the differentiation of the demands on the comprehensiveness and the content of

the specifications for a new product, grants greater rights to the developer and the client and increases their mutual responsibility. It was established that the interrelations between them, as a rule, should be formed on a contractual basis. This is a very important provision, it is dictated by the new methods of management.

Whereas previously the responsibility for the technical level of the product being developed was "dispersed" among many interested organizations, now it has been assigned entirely to the developer, who is exempt from many, in the past mandatory consultations. The client is responsible for the conformity of the values of the indicators of the product, which are contained in the initial requirements and the technical assignment, to the world level for the stated period of production.

The abolition of the obligatoriness of submittal for approval stems first of all from the increased level of the training of designers, who for the realization of their creative potential need greater independence.

The demands of the main developers on the suppliers of materials, semifinished products, and components have become mandatory. Whereas previously such a supplier could evade the delivery of a product of the required quality, having cited its lack, now, having received an order of the main developer, he is obliged to accept the order and, if needed, to develop the existing product or to carry out new development. A very important problem, which hindered in the past the achievement of a high quality of the final product, was solved in this way.

#### The Main Organizations

However, all this does not mean that the main organizations for the type of product will not be able to influence the process of the development of a new product. Their very important role and task consist in the preparation of qualified, sound conclusions on the technical assignments and the examination of the cards of the technical level.

The question arises: If the main organizations in case of the development of a new product by other enterprises are deprived of the right of "veto," will they not lose the opportunity to pursue a unified technical policy with respect to the product attached to them?

So that this would not happen, the main ministry should establish in the standards long-range demands, a unified dimensional series and (on its basis) the optimum type size series and promising types. The existence of such standards, the requirements of which are mandatory for all developers regardless of department affiliation, in itself will in many respects ensure the pursuit of a unified technical policy and a high quality of the product, without checking the creativity of designers in the search for specific technical solutions.

Such standards in addition will make easier for the client the establishment in the initial requirements of the values of the indicators, which correspond to the world level for the stated period of production.



Hence, too, one of the urgent tasks of the main ministries: jointly with the State Committee for Standards to organize the drawing up of standards as general technical requirements for all the output during the first 2-3 years of the 12th Five-Year Plan.

#### Changes in Coordination

The decree abolishes the procedure of the coordination and approval of the technical assignment for the development of the product, the card of the technical level and quality of the product, the specifications, and the program and method of acceptance tests.

The technical assignment for the development of a product is submitted for approval only to the client and, in his absence, to the basic user. The client himself now determines the need for their submittal for approval to other organizations (the organs of state supervision, trade union organs, and other specialized organizations, for example, the All-Union Scientific Research Institute of Industrial Design).

The main organization submits the technical assignments for approval only in one case--in the absence of a client and a basic user, for example, in case of the development of general machine building items.

The card of the technical level and quality of the product is now drawn up of the developer of the technical assignment and is signed by the client (the basic user) of the product at the same time as the submitting of the technical assignment for approval and by the main organization for the type of product when issuing the conclusion on the conformity of the requirements of the assignment to the world level. Only the basic characteristics for the given type of product are reflected in it.

The specifications are the basic legal document, for conformity to which the product is checked in case of its delivery. They are coordinated in the acceptance commission: the signing of the acceptance certificate of the prototype of the product signifies the complete conformity of the specifications.

Previously the specifications were approved, as a rule, in the main ministry for the type of product. Now the developing ministry specifies the procedure of their approval, while registration is carried out by the territorial organs of the State Committee for Standards at the location of the developer, which eliminates unnecessary trips to Moscow. Their examination is not made prior to registration.

The procedure of the approval of specifications should envisage the drawing up of a list of types of products, the specifications for which are liable to approval in the ministry itself, in associations, and at enterprises. Such a list should be coordinated with the lists of types of products, which are of the greatest national economic importance, products, which are liable to certification, and products, which are liable to state tests.

The program and method of state acceptance tests and prototypes are also formulated by the developer. The acceptance commission if necessary makes refinements in them.

#### The Role of Standards

As is known, the procedure of developing the technical specifications for a new product is regulated mainly by the standards of the system of the development and delivery of a product to the works (SRPP). The improvement of this systems is an indispensable condition of the acceleration of scientific and technical progress. But the work, which has been performed in the past 2years by the State Committee for Standards jointly with the State Committee for Science and Technology, ministries, and departments, unfortunately, did not yield the anticipated results--in part because the problems, which go beyond the competence of the State Committee for Standards, were not solved, and in part because a number of statutes, which had been adopted earlier, had lost their topicality.

The procedure approved by the government is aimed at the settlement of the main questions which are connected with the development and coordination specifically of the four above-named documents (the technical assignment, the card of the technical level, the specifications, and the program and method of tests), and by no means signifies the cancellation of all the prevailing standards of the system of the development and delivery of a product to the works.

This procedure constitutes only a part of the overall process of the development of a product, which includes research and development, tests, the activity of the acceptance commissions, the preparation of production, as well as other questions which are regulated by the standards. It is a matter in this case of the need for the making of the corresponding changes in the prevailing standards, while prior to the making of these changes the provisions of the decree should be fulfilled directly.

After the inclusion of the changes in the standards of the system of the development and delivery of a product to the works they are liable to checking on the part of the organs of the State Committee for Standards during the entire term of effect. The constant checking of the fulfillment of this decree of the government is thereby ensured through the standards.

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## DEVELOPMENT, USES OF LIQUID CRYSTALS

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[Interview with Doctor of Physical Mathematical Sciences Professor Yevgeniy Ivanovich Ryumtsev, chief of the Department of Polymer Physics of the Scientific Research Institute of Physics attached to Leningrad State University, by VECHERNYY LENINGRAD correspondent N. Odintsova under the rubric "Meetings in Our Krugozor Scientific Cognitive Club": "The Occupations of Liquid Crystals"; date, place, and occasion not given; first two paragraphs are VECHERNYY LENINGRAD introduction]

[Text] It had grown dark beyond the window. One of the staff members of the laboratory flipped the switch, and light blazed in the room. In order not to lose sight of the gleam of the indicators, the people standing at the instruments involuntarily squinted, but in the light the readings of the gauges became only clearer and the figures on the scales became more distinct. These were liquid crystal indicators working.

In an interview with our correspondent Doctor of Physical Mathematical Sciences Professor Ye.I. Ryumtsev, chief of the Department of Polymer Physics of the Scientific Research Institute of Physics attached to Leningrad State University, tells about the secrets of liquid crystals and about their application in science and technology:

[Answer] As to instruments with liquid crystal scales, our industry has already begun the production of such devices. In the near future you and I will watch liquid crystal televisions in a light, and not a dark room, and the better the screen is illuminated, the clearer the picture will be....

[Question] Yevgeniy Ivanovich, we have now already become accustomed to the word combination "liquid crystal." Nearly everyone has either an Elektronika watch or a microcalculator, and the majority of us know that they operate on liquid crystals. And still, if you think it over, some contradiction has been incorporated in this word combination. For "liquid crystal" sounds almost as strange as, say, "dry water"....

[Answer] Indeed, in nature there three states of matter—solid, liquid, and gas. Liquid crystals, like centaurs, combine the properties of two different states. As a liquid they are fluid and take the form of the vessels, into

which they are poured, but their molecules are arranged in an orderly manner, like the molecules of a crystal.

A substance with such properties proved to be so unusual that even the Austrian botanist Reinizer, having obtained a liquid crystal for the first time when heating a complex organic compound, for a long time could not believe his discovery. At that time, about 100 years ago, liquid crystals or mesophases, as they began to call them, that is, intermediate states between a liquid and a solid substance, appeared to everyone as a strange curiosity, and they soon forgot about them.

The interest in liquid crystals increased in the 1920's and 1930's, when their very unusual properties were discovered.

[Question] And the credit for this, as far as I know, belongs to Leningrad scientists.

[Answer] Yes, to Professor V.K. Frederiks, the 100th anniversary of whose birth was recently celebrated, and his student, V.N. Tsvetkov--now a corresponding member of the USSR Academy of Sciences. Their research showed that liquid crystals can change very greatly their optical properties--first of all color and transparency, under the influence of very small external forces--electric and magnetic fields, mechanical stresses, temperature changes. Thus, for example, a thin cloudy layer of a liquid crystal becomes transparent when exposed to a magnetic or electric field of a specific magnitude. Scientists of the entire world call this phenomenon the Frederiks transition.

Such unusual peculiarities make liquid crystals very suitable for extensive practical use. And first of all this concerns indicating devices of various types--the dials of clocks, luminous display boards, scales of instruments. I believe that it would not be an exaggeration to say that liquid crystals are playing in the miniaturization of a video picture the same role as transistors played in their day in the miniaturization of electronic circuits.

More than 100 types of liquid crystal indicating devices have now been developed in our country. Take, for example, the same watch. Recently the production of a watch with a calendar display for 100 years in the future and with a musical sound synthesizer was begun, while subsequent models of the watch called the Doctor have been constructed so that by means of them it will be able to measure blood pressure and to check the heart rhythm.

In all during the past decade an entire sector of industry, which produces liquid crystal indicated devices, has been established. Leningrad scientists--from Leningrad State University and the Institute of High Molecular Compounds of the USSR Academy of Sciences--actively participated in its establishment. For the development, the organization of the production, and the supply of the national economy of the country with such devices a group of scientists and production workers of Moscow, Leningrad, and several other cities were awarded the USSR State Prize in Science and Technology.



However, watches, microcalculators, luminous display boards, and measuring instruments are only one, although a broad area of the application of liquid crystals. No less hopes are connected with the use of liquid crystals in television devices and displays. Tell me, what is the most important, most extensive, and most short-lived part of a television?

[Question] Probably the picture tube.

[Answer] Quite correct, the picture tube, the cathode-ray tube, in which an electron beam runs, plotting the picture line by line onto the screen. Precisely owing to the picture tube a television has a once and forever established form of a quite large box. But now imagine a nearly flat object which consists of two glass plates, the space between which is filled with a liquid crystal. A microelectronic circuit has been applied to the back of one of the plates. This is the television of the future. It is possible to hang it on the wall like a picture. The size of the screen is any one. The television is inexpensive and economical, convenient.

The first models of such televisions already exist. So that a real revolution in television awaits you and me.

[Question] Do liquid crystals also have other "occupations"?

[Answer] Many others as well. They, for example, are being used very successfully in medicine, more precisely in its new, rapidly developing field--medical thermography. For our good acquaintance--the mercury thermometer--measures only to ten's of a degree, while physicians need to know the temperature more precisely, and not only at one or several points of the body, but simultaneously on a quite large surface. For local, small temperature changes can indicate quite precisely to the physician the site where an inflammatory process is occurring or even where a malignant tumor has appeared. And here liquid crystals are coming to the aid of medical personnel. It is sufficient to apply a polymer film, into the cavity of which a liquid crystal has been poured, to the skin, and the film will immediately turn different colors and will show the temperature of the corresponding part of the body, moreover, its change by only a hundredth of a degree will already give a change of the color of the film, which is noticeable to the eye.

By means of precisely the same films it is also possible to find the site of damage in a microelectronic circuit--additional heat is liberated there, to make visible the radiation of a microwave antenna, or even to find out the distribution of the field in a laser beam.

It is also possible to use liquid crystals in data storage devices. For a liquid crystal has viscosity and after the cessation of the external effect does not immediately return to the initial state, but for some time retains a trace of the former influence. Such a "memory" can be harmful, for example, in television, where the liquid crystal should react instantaneously to each new signal, while in data storage devices it is very useful. Time will pass, and a liquid crystal computer memory will not surprise anyone. Now the recently developed high molecular liquid crystals, which have a high viscosity, seem very promising for this purpose.

[Question] As far as I know, the study of the properties of such liquid crystals is one of the directions of the work of the department which you supervise....

[Answer] Yes, for the past 5 years scientists of Leningrad University and the Institute of High Molecular Compounds have been working jointly on this problem. For the first time in the country chemists were able to synthesize, while physicists were able to study the properties of very complex compounds which upon heating pass into a liquid crystal state. In the future the development of such substances is important for the solution of one of the most important problems--the obtaining of high-strength and thermostable polymer fiber. For if a fiber made of liquid crystal filaments is "spun," it will be strong, like a steel cable, but at the same time light and inexpensive. And it will make it possible to replace many metal parts with polymer parts, which promises to give in the future an enormous economic impact.

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